
PART U-2

HAZARDOUS MATERIALS-LIQUEFIED PETROLEUM GAS

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WAC 296-307-410 Storage and handling of liquefied petroleum gases.

[Recodified as § 296-307-410. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-410, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41001 What does this part cover? Chapter 296-307 WAC Part U2 covers the storage and handling of liquefied petroleum gases.

The requirements of WAC 296-307-410 apply to all LP-gas installations covered by this part.

For additional requirements related to:	See WAC:
Cylinder systems	296-307-415
Systems using non-DOT containers	296-307-420
LP-gas as a motor fuel	296-307-425
Storage of containers awaiting use or resale	296-307-430
LP-gas installations on commercial vehicles	296-307-435
LP-gas service stations	296-307-440

[Statutory Authority: Chapter 49.17.040 RCW. 98-24-096 (Order 98-13) § 296-307-41001, filed 12/01/98, effective 03/01/99. [Recodified as § 296-307-41001. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41001, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41003 Which LP-gas installations are not covered by this part?

- (1) This part does not apply to:
 - (a) LP-gas refrigerated storage systems;
 - (b) LP-gas used with oxygen;
 - (c) LP-gas used in utility gas plants (covered by the National Fire Protection Association Standard for the Storage and Handling of Liquefied Petroleum Gases at Utility Gas Plants, NFPA No. 59-1968);
 - (d) Low-pressure (less than 1/2 pound per square inch or 14 inches water column) LP-gas piping systems, and the installation and operation of residential and commercial appliances supplied through such systems. The National Fire Protection Association Standard for the Installation of Gas Appliances and Gas Piping, NFPA 54-1969 apply to these systems.
- (2) LP-gas installations, equipment, and appliances that met the requirements of the National Fire Protection Association Standard for the Storage and Handling of Liquefied Petroleum Gases NFPA No. 58-1972, 1973 at the time of manufacture or installation may be used if they do not create a hazard to employees.

[Recodified as § 296-307-41003. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41003, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41005 What definitions apply to this part?

“Adequate ventilation,” for fire prevention during normal operation, means the concentration of the gas in a gas-air mixture does not exceed 25% of the lower flammable limit.

“Containers” means all vessels, such as tanks, cylinders, or drums, used to transport or store LP-gases.

“DOT” means the federal Department of Transportation.

“DOT container” means a container that meets DOT regulations.

WAC 296-307-41005 (Cont.)

“**DOT cylinder**” means a cylinder that meets DOT regulations.

“**DOT regulations/requirements/specifications**” means the DOT regulations of 49 CFR part 178.

“**Liquefied petroleum gases**” and “**LP-gas**” means any material that is composed mostly of any of the following: Hydrocarbons, or mixtures of them; propane; propylene; butanes (normal butane or iso-butane); and butylenes.

“**PSIA**” pounds per square inch absolute.

“**PSIG**” means pounds per square inch gauge.

“**Systems**” means an assembly of the container or containers, major devices such as vaporizers, safety-relief valves, excess flow valves, regulators, and piping connecting such parts.

“**Vaporizer-burner**” means an integral vaporizer-burner unit, dependent upon the heat generated by the burner to vaporize the liquid used for dehydrators or dryers.

[Recodified as § 296-307-41005. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41005, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41007 When must LP-gas be odorized? You must ensure that all LP-gas is odorized by an approved agent to indicate by distinct odor, the presence of gas down to concentration in air of a maximum of 1/5 the lower limit of flammability.

Exception: Odorization is not required if it will create a hazard in further processing, or if it serves no useful purpose as a warning agent.

Note: The odorization requirement may be met by using 1.0 pounds of ethyl mercaptan, 1.0 pounds of thiophene, or 1.4 pounds of amyl mercaptan per ten thousand gallons of LP-gas. You may use any odorant and quantity that meets the requirements of this section.

[Recodified as § 296-307-41007. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41007, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41009 Must LP-gas containers and equipment be approved?

- (1) Each system of DOT containers must have approved container valves, connectors, manifold valve assemblies, and regulators.
- (2) Each non-DOT system using containers of 2,000 gallons or less water capacity, must have a container assembly, one or more regulators, and other necessary parts. The entire system, or the container assembly with the regulators, must be individually listed by a nationally recognized testing laboratory.

“**Container assembly**” means the container and fittings for all openings, including shut-off valves, excess flow valves, liquid-level gauging devices, safety-relief devices, and protective housing.

- (3) In systems using containers of over 2,000 gallons water capacity, each regulator, container, valve, excess flow valve, gauging device, and relief valve, must be listed by a nationally recognized testing laboratory.
- (4) All DOT containers must be constructed, tested, and stamped according to the DOT specifications effective at the date of their manufacture.

[Recodified as § 296-307-41009. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41009, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41011 What construction and test requirements must containers meet?

- (1) Containers must be designed, constructed, and tested according to the *Rules for Construction of Unfired Pressure Vessels, section VIII, Division 1, American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code*, 1968 edition, unless otherwise specified.
- (2) Containers constructed according to the 1949 and earlier editions of the ASME Code are exempt from U-2 through U-10 and U-19 of the code. Containers constructed according to U-70 in the 1949 and earlier editions do not meet the requirements of this section.
- (3) Containers designed, constructed, and tested prior to July 1, 1961, according to the *Code for Unfired Pressure Vessels for Petroleum Liquids and Gases*, 1951 edition with 1954 Addenda, of the American Petroleum Institute and the American Society of Mechanical Engineers are considered in compliance. Containers constructed according to API-ASME Code do not have to comply with section I or with the appendix to section I. W-601 through W-606 in the 1943 and earlier editions do not apply.

[Recodified as § 296-307-41011. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41011, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41013 How must containers be welded?

- (1) You must ensure that all welding to the shell, head, or any other part of the container subject to internal pressure, meets the requirements of the code under which the tank was fabricated. You may weld on saddle plates, lugs, or brackets attached to the container by the tank manufacturer.
- (2) When you must repair or modify DOT containers by welding, you must return the container to a qualified manufacturer, making containers of the same type, to make the repair or modification according to DOT regulations.

[Recodified as § 296-307-41013. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41013, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41015 How must containers be marked?

- (1) You must ensure that containers are marked according to DOT regulations or with the following:
 - (a) Indication that the container meets the requirements of the code under which it is constructed, and all marks required by that code.
 - (b) Indication whether the container is designed for underground or aboveground installation or both. If intended for both and different style hoods are provided, the marking must indicate the proper hood for each type of installation.
 - (c) The name and address of the supplier of the container, or with the trade name of the container.
 - (d) The water capacity of the container in pounds or gallons, United States standard.
 - (e) The pressure in psig, for which the container is designed.
 - (f) The wording "This container must not contain a product with a vapor pressure greater than _ psig at 100°F."
 - (g) The tare weight, for containers with a water capacity of three hundred pounds or less.
 - (h) Indication of the maximum fill level for liquid at temperatures between 20°F and 130°F. Markings must be in maximum increments of 20°F. This marking may be located on the liquid level gauging device.

WAC 296-307-41015 (Cont.)

Exception: Containers provided with fixed maximum level indicators or that are filled by weighing are exempt from this requirement.

- (i) The outside surface area in square feet.
 - (2) The markings must be on a metal nameplate attached to the container so that it is visible after the container is installed.
 - (3) When LP-gas and one or more other gases are stored or used in the same area, the containers must be marked to identify their content. Marking must be according to American National Standard Z48.1-1954, "Method of Marking Portable Compressed Gas Containers to Identify the Material Contained."
- [Recodified as § 296-307-41015. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41015, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41017 Where must containers be located? You must ensure that containers are located according to the following:

- (1) Containers and first stage regulating equipment are located outdoors.
Containers may be located indoors under any of the following conditions:
 - (a) In buildings used exclusively for container charging, vaporization pressure reduction, gas mixing, gas manufacturing, or distribution;
 - (b) When portable use is necessary and meets the requirements of WAC 296-307-41509;
 - (c) LP-gas fueled stationary or portable engines that meet the requirements of WAC 296-307-42521 or 296-307-42523;
 - (d) LP-gas fueled industrial trucks that meet the requirements of WAC 296-307-42525;
 - (e) LP-gas fueled vehicles garaged according to WAC 296-307-42527; or
 - (f) Containers awaiting use or resale when stored according to WAC 296-307-430.
- (2) Each individual container is located away from the nearest important building, group of buildings, or line of adjoining property that may be built on, according to Table U-1.

TABLE U-1 Minimum Distances			
Water capacity per container	Containers		Between above- ground containers
	Underground	Aboveground	
Less than 125 gals ^a	10 feet	None	None
125-250 gals	10 feet	10 feet	None
251-500 gals	10 feet	10 feet	3 feet
501-2,000 gals	25 feet ^b	25 feet ^b	3 feet
2,001-30,000 gals	50 feet	50 feet	5 feet
30,001-70,000 gals	50 feet	75 feet	1/4 sum of diameters of adjacent containers
70,001-90,000 gals	50 feet	100 feet	1/4 sum of diameters of adjacent containers

WAC 296-307-41017 (Cont.)

- (a) If the total water capacity of a multicontainer installation at a consumer site is 501 gallons or more, the minimum distance must comply with this table, applying the aggregate capacity instead of the capacity per container. For multiple installations, installations must be at least twenty-five feet apart. Do not apply the MINIMUM DISTANCES BETWEEN ABOVEGROUND CONTAINERS to such installations.
 - (b) Distance requirements may be reduced to 10 feet for a single container of 1200 gallons water capacity or less, if the container is at least 25 feet from any other LP-gas container of more than 125 gallons water capacity.
 - (c) In buildings devoted exclusively to gas manufacturing and distributing operations, the distances may be reduced if no containers of more than 500 gallons water capacity are located closer than ten feet to gas manufacturing and distributing buildings.
- (3) Containers installed for use must not be stacked one above the other.
 - (4) In industrial installations involving containers of 180,000 gallons total water capacity or more, where serious exposures from the container to adjacent properties are common, firewalls or other means of protection designed and constructed according to good engineering practices are required.
 - (5) Readily ignitable material such as weeds and long dry grass is removed within ten feet of any container.
 - (6) The minimum separation between LP-gas containers and flammable liquid tanks is twenty feet; the minimum separation between a container and the centerline of the dike is ten feet.

Exception: This does not apply when LP-gas containers of 125 gallons or less capacity are installed adjacent to Class III flammable liquid tanks of 275 gallons or less capacity.

- (7) The accumulation of flammable liquids under adjacent LP-gas containers is prevented by a means such as diking, diversion curbs, or grading.
- (8) When dikes are used with flammable liquid tanks, no LP-gas containers are located within the diked area.
[Statutory Authority: Chapter 49.17.040 RCW. 98-24-096 (Order 98-13) § 296-307-41017, filed 12/01/98, effective 03/01/99.
[Recodified as § 296-307-41017. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41017, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41019 What requirements apply to valves and accessories?

- (1) Valves, fittings, and accessories connected directly to the container including primary shut-off valves, must have a rated working pressure of at least 250 psig and must be of material and design suitable for LP-gas service. The use of cast iron for container valves, fittings, and accessories is prohibited. Container valves may be made of malleable or nodular iron.
- (2) Connections to containers must have shut-off valves located as close to the container as practical.

Exception: This does not apply to safety-relief connections, liquid level gauging devices, and plugged openings.

- (3) All required excess flow valves must close automatically at the rated flows of vapor or liquid specified by the manufacturer. The connections, lines, valves, and fittings must have a greater capacity than the rated flow of the excess flow valve.

WAC 296-307-41019 (Cont.)

- (4) Liquid level gauging devices that are constructed so that outward flow is a maximum of that passed by a No. 54 drill size opening may be installed without excess flow valves.
- (5) Openings from container or through fittings attached directly on container to which pressure gauge connection is made, need not have shut-off or excess flow valves if such openings are restricted to not larger than No. 54 drill size opening.
- (6) Required excess flow and back pressure check valves must be located inside the container or outside where the line enters the container. When located outside, the installation must be made to prevent any stress beyond the excess flow or back pressure check valve from causing a break between the container and the valve.

Exception: This does not apply to systems using containers with a water capacity greater than 2-1/2 pounds (nominal one pound LP-gas capacity).

- (7) Excess flow valves must be designed with a bypass that is a maximum of No. 60 drill size opening to allow equalization of pressures.
- (8) Containers of more than 30 gallons water capacity and less than 2,000 gallons water capacity, filled on a volumetric basis, and manufactured after December 1, 1963, must be equipped for filling into the vapor space.

[Recodified as § 296-307-41019. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41019, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41021 What requirements apply to piping, tubing, and fittings?

- (1) Pipe must be wrought iron or steel (black or galvanized), brass, copper, or aluminum alloy. Aluminum alloy pipe must be at least Schedule 40 according to the specifications for Aluminum Alloy Pipe, ANSI H38.7-1969 (ASTM, B241-1969), and must be suitably marked at each end of each length indicating compliance with ANSI specifications. Alloy 5456 is prohibited.

Exception: This does not apply to piping for LP-gas used as a motor fuel or to piping on commercial vehicles.

- (2) Aluminum alloy pipe must be protected against external corrosion whenever:
 - (a) It is in contact with dissimilar metals other than galvanized steel; or
 - (b) Its location is subject to repeated wetting by such liquids as water (except rain water), detergents, sewage, or leaking from other piping; or
 - (c) It passes through flooring, plaster, masonry, or insulation.Galvanized sheet steel or pipe, galvanized inside and out, are considered suitable protection.
- (3) Aluminum pipe must be three-fourths inch nominal and shall not be used for pressures exceeding 20 psig. Aluminum alloy pipe must not be installed within six inches of the ground.
 - (a) Vapor piping with operating pressures not exceeding 125 psig must be suitable for a working pressure of at least 125 psig. Pipe must be at least Schedule 40 ASTM A-53-69, Grade B Electric Resistance Welded and Electric Flash Welded Pipe or equal.

WAC 296-307-41021 (Cont.)

- (b) Vapor piping with operating pressures over 125 psig and all liquid piping must be suitable for a working pressure of at least 250 psig. Pipe must be at least Schedule 80 if joints are threaded or threaded and back welded. At least Schedule 40 (ASTM A-53-1969 Grade B Electric Resistance Welded and Electric Flash Welded Pipe or equal) must be used if joints are welded, or welded and flanged.
- (4) Tubing must be seamless copper, brass, steel, or aluminum alloy. Copper tubing must be of Type K or L or equivalent as covered in the Specification for Seamless Copper Water Tube, ANSI H23.1-1970 (ASTM B88-1969). Aluminum alloy tubing must be of Type A or B or equivalent as covered in Specification ASTM B210-1968 and must be suitably marked every 18 inches indicating compliance with ASTM specifications. The minimum nominal wall thickness of copper tubing and aluminum alloy tubing must be as specified in Table U-2 and Table U-3.

TABLE U-2 Wall Thickness of Copper Tubing¹			
<i>Note: The standard tube size is one-eighth inch smaller than its nominal outside diameter.</i>			
Standard size (inches)	Nominal O.D. (inches)	Nominal wall thickness (inches)	
		Type K	Type L
1/4	0.375	0.035	0.030
3/8	0.500	0.049	0.035
1/2	0.625	0.049	0.040
5/8	0.750	0.049	0.042
3/4	0.875	0.065	0.045
1	1.125	0.065	0.050
1 1/4	1.375	0.065	0.055
1 1/2	1.625	0.072	0.060
2	2.125	0.083	0.070
¹ Based on data in Specification for Seamless Copper Water Tubing, ANSI H23.1-1970 (ASTM B-88-69).			

TABLE U-3 Wall Thickness of Aluminum Alloy Tubing¹		
Outside diameter (inches)	Nominal wall thickness (inches)	
	Type A	Type B
3/8	0.035	0.049
1/2	0.035	0.049
5/8	0.042	0.049
3/4	0.049	0.058
¹ Based on data in Standard Specification for Aluminum-Alloy Drawn Seamless Coiled Tubes for Special Purpose Applications, ASTM B210-68.		

- (5) Aluminum alloy tubing must be protected against external corrosion whenever:
- (a) It is in contact with dissimilar metals other than galvanized steel; or
- (b) Its location is subject to repeated wetting by liquids such as water (except rainwater), detergents, sewage, or leakage from other piping; or

WAC 296-307-41021 (Cont.)

- (c) It passes through flooring, plaster, masonry, or insulation.

Galvanized sheet steel or pipe, galvanized inside and out, are considered suitable protection.

- (6) The maximum outside diameter for aluminum alloy tubing must be three-fourths inch and must not be used for pressures exceeding 20 psig. Aluminum alloy tubing installed within six inches of the ground is prohibited.
- (7) In systems where the gas in liquid form enters the building without pressure reduction, only heavy walled seamless brass or copper tubing with an internal diameter a maximum of 3/32 inch, and a wall thickness of at least 3/64 inch shall be used.

Exception: This requirement does not apply to research and experimental laboratories, buildings or separate fire divisions of buildings used exclusively for housing internal combustion engines, and to commercial gas plants or bulk stations where containers are charged, nor to industrial vaporizer buildings, nor to buildings, structures, or equipment under construction or undergoing major renovation.

- (8) Pipe joints must be screwed, flanged, welded, soldered, or brazed with a material having a melting point over 1,000°F. Joints on seamless copper, brass, steel, or aluminum alloy gas tubing shall be made by approved gas tubing fittings, or soldered or brazed with a material having a melting point over 1,000°F.
- (9) For operating pressures of 125 psig or less, fittings must be designed for a pressure of at least 125 psig. For operating pressures above 125 psig, fittings must be designed for a minimum of 250 psig.
- (10) Threaded cast iron pipe fittings are prohibited. Aluminum alloy fittings must be used with aluminum alloy pipe and tubing. Insulated fittings must be used where aluminum alloy pipe or tubing connects with a dissimilar metal. You may use malleable, nodular, or higher strength gray iron for fittings.

Note: Strainers, regulators, meters, compressors, pumps, etc., are not to be considered as pipe fittings.

- (11) All materials such as valve seats, packing, gaskets, diaphragms, etc., must be resistant to the action of LP-gas under the service conditions to which they are subjected.
- (12) All piping, tubing, or hose must be tested after assembly and proved free from leaks at least normal operating pressures. After installation, piping and tubing of all domestic and commercial systems must be tested and proved free of leaks using a manometer or equivalent device that will indicate a drop in pressure. Test made by flame is prohibited.
- (13) You must ensure that piping allows for expansion, contraction, jarring, and vibration, and settling. You may use flexible connections.
- (14) Piping outside buildings may be buried, aboveground, or both, but must be well supported and protected against physical damage. Where soil conditions warrant, all piping must be protected against corrosion. Where condensation may occur, the piping must be pitched back to the container, or you must provide a means for revaporization of the condensate.

[Recodified as § 296-307-41021. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41021, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41023 What specifications must hoses meet?

- (1) Hose shall be fabricated of materials that are resistant to the action of LP-gas in the liquid and vapor phases. If wire braid is used for reinforcing the hose, it must be of corrosion-resistant material such as stainless steel. (2) Hose subject to container pressure must be marked "LP-gas" or "LPG" at not greater than ten-foot intervals.
- (3) Hose subject to container pressure must be designed for a bursting pressure of not less than 1,250 psig.
- (4) Hose subject to container pressure must be listed by a nationally recognized testing laboratory.
- (5) Hose connections subject to container pressure must be able to withstand, without leaking, a test pressure of not less than 500 psig.
- (6) Hose and hose connections on the low-pressure side of the regulator or reducing valve must be designed for a bursting pressure of not less than 125 psig or five times the set pressure of the relief devices protecting that portion of the system, whichever is higher.
- (7) Hose may be used on the low-pressure side of regulators to connect to other than domestic and commercial gas appliances under the following conditions:
 - (a) The appliances connected with hose are portable and need a flexible connection.
 - (b) For use inside buildings, the hose is of minimum practical length, but is a maximum of six feet. Hose must not extend from one room to another, nor pass through any walls, partitions, ceilings, or floors. Such hose must not be concealed from view or used in a concealed location.

Exception: For use outside of buildings, the hose may exceed this length but must be kept as short as practical.

- (c) The hose must be approved and must not be used where it may be exposed to temperatures above 125°F. The hose must be securely connected to the appliance. Rubber slip ends are prohibited.
- (d) The shut-off valve for an appliance connected by hose must be in the metal pipe or tubing and not at the appliance end of the hose. When shut-off valves are installed close to each other, precautions must be taken to prevent operation of the wrong valve.
- (e) Hose used for connecting to wall outlets must be protected from physical damage.

[Recodified as § 296-307-41023. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41023, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41025 What requirements apply to safety devices?

- (1) Every container except those constructed according to DOT specifications and every vaporizer (except motor fuel vaporizers and vaporizers described in WAC 296-307-41029(3) and 296-307-42007 (6)(a) whether heated by artificial means or not, must have one or more safety-relief valves of spring-loaded or equivalent type. These valves must be arranged to afford free vent to the outer air with discharge not less than five feet horizontally away from any opening into the building that is below such discharge. The rate of discharge must be according to the requirements of subsection (2) or (4) of this section.
- (2) Minimum required rate of discharge in cubic feet per minute of air at one hundred twenty percent of the maximum permitted start to discharge pressure for safety-relief valves to be used on containers other than those constructed according to DOT specification must be as follows:

WAC 296-307-41025 (Cont.)

Surface area sq. ft.	Flow rate CFM air	Surface area sq. ft.	Flow rate CFM air	Surface area sq. ft.	Flow rate CFM air
20 or less	626	170	3,620	550	9,470
25	751	175	3,700	600	10,170
30	872	180	3,790	650	10,860
35	990	185	3,880	700	11,550
40	1,100	190	3,960	750	12,220
45	1,220	195	4,050	850	13,540
50	1,330	200	4,130	900	14,190
55	1,430	210	4,300	950	14,830
60	1,540	220	4,470	1,000	15,470
65	1,640	230	4,630	1,050	16,100
70	1,750	240	4,800	1,100	16,720
75	1,850	250	4,960	1,150	17,350
80	1,950	260	5,130	1,200	17,960
85	2,050	270	5,290	1,250	18,570
90	2,150	280	5,450	1,300	19,180
95	2,240	290	5,610	1,350	19,780
100	2,340	300	5,760	1,400	20,380
105	2,440	310	5,920	1,450	20,980
110	2,530	320	6,080	1,500	21,570
115	2,630	330	6,230	1,550	22,160
120	2,720	340	6,390	1,600	22,740
125	2,810	350	6,540	1,650	23,320
130	2,900	360	6,690	1,700	23,900
135	2,990	370	6,840	1,750	24,470
140	3,080	380	7,000	1,800	25,050
145	3,170	390	7,150	1,850	25,620
150	3,260	400	7,300	1,900	26,180
155	3,350	450	8,040	1,950	26,750
160	3,440	500	8,760	2,000	27,310
165	3,530				

Surface area = total outside surface area of container in square feet.

- (3) When the surface area is not stamped on the name plate or when the marking is not legible, calculate the area with one of the following formulas:

- Hemispherical heads: Area = (overall length) X (outside diameter) X 3.1416.
- Other than hemispherical heads: Area = (overall length) + 0.3 (outside diameter) X (outside diameter) X 3.1416.

Note: This formula is not exact, but will give results within the limits of practical accuracy for the sole purpose of sizing relief valves.

- Spherical container: Area = (outside diameter)² X 3.1416.
- Flow rate: CFM air = required flow capacity in cubic feet per minute of air at standard conditions, 60° F and atmospheric pressure (14.7 psia).

WAC 296-307-41025 (Cont.)

For containers with total outside surface area greater than 2,000 sq. ft., the formula is: Flow rate CFM air = 53.632 A^{0.82} where A = outside surface area of the container in square feet.

Valves not marked "air" have flow rate marking in cubic feet per minute of LP-gas. These can be converted to ratings in cubic feet per minute of air by multiplying the LP-gas ratings by factors listed below. Air flow ratings can be converted to ratings in cubic feet per minute of LP-gas by dividing the air ratings by the factors listed below.

Air Conversion Factors					
Container Type	100	125	150	175	200
Air Conversion Factor	1.162	1.142	1.113	1.078	1.010

- (4) The minimum required rate of discharge for safety-relief valves for LP-gas vaporizers (steam heated, water heated, and direct fired) must be determined as follows:
 - (a) Obtain the total surface area by adding the surface area of vaporizer shell in square feet directly in contact with LP-gas and the heat exchanged surface area in square feet directly in contact with LP-gas.
 - (b) Obtain the minimum required rate of discharge in cubic feet of air per minute, at 60°F and 14.7 psia from subsection (2) of this section, for this total surface area.
- (5) Container and vaporizer safety-relief valves must be set to start to discharge, with relation to the design pressure of the container, according to the following:

Containers	Minimum (Percent)	Maximum (Percent)
ASME Code; Par. U-68, U-69-1949 and earlier editions.	110	*125
ASME Code; Par. U-200, U-201-1949 edition	88	*100
ASME Code-1950, 1952, 1956, 1959, 1962, 1965 and 1968 (Division 1) editions	88	*100
API-ASME Code-all editions	88	*100
DOT	As prescribed in 49 CFR Chapter I	
*Manufacturers of safety-relief valves are allowed a plus tolerance not exceeding 10% of the set pressure marked on the valve.		

- (6) Safety-relief devices used with systems employing non-DOT containers must be constructed to discharge at not less than the rates shown in subsection (2) of this section, before the pressure is in excess of 120% of the maximum (not including the 10% referred to in subsection (5) of this section) permitted start-to-discharge pressure setting of the device.
- (7) In high temperature areas, you must use a lower vapor pressure product or a higher designed pressure vessel to prevent the safety valves from opening. The tanks may be protected by cooling devices such as spraying, shading, or other means.
- (8) Safety-relief valves must be arranged to minimize tampering. For external pressure setting or adjustment, the relief valves must have an approved sealable adjustment.

WAC 296-307-41025 (Cont.)

- (9) Shut-off valves are prohibited between safety-relief devices and the container, equipment, or piping.

Exception: A shut-off valve may be used where the arrangement of the valve allows the required capacity flow through the safety-relief device.

- (10) Safety-relief valves must have direct communication with the vapor space of the container.
- (11) Each safety-relief valve must be plainly and permanently marked with the following:
- (a) Container type of the pressure vessel on which the valve is designed to be installed;
 - (b) The pressure in psig at which the valve is set to discharge;
 - (c) The actual rate of discharge of the valve in cubic feet per minute of air at 60°F and 14.7 psia; and
 - (d) The manufacturer's name and catalog number.

For example: T200-250-4050 AIR: Indicates that the valve is suitable for use on a Type 200 container, that it is set to start to discharge at 250 psig; and that its rate of discharge is 4,050 cubic feet per minute of air.

- (12) Safety-relief valve assemblies and their connections must be large enough to provide the required rate of flow for the container on which they are installed.
- (13) A hydrostatic relief valve must be installed between each pair of shut-off valves on LP-gas liquid piping. The start-to-discharge pressure setting of such relief valves must be a maximum of 500 psig. The minimum setting on relief valves installed in piping connected to non-DOT containers shall be 140% of the container relief valve setting. For piping connected to DOT containers, the minimum must be 400 psig. The relief valve should not be installed in the pump discharge piping if the same protection can be provided by installing the relief valve in the suction piping. The start-to-discharge pressure setting of such a relief valve, if installed on the discharge side of a pump, must exceed the maximum pressure permitted by the recirculation device in the system.
- (14) The discharge from any safety-relief device must not terminate in or beneath any building.

Exception: This requirement does not apply to relief devices covered by WAC 296-307-41017(1), 296-307-41507(1) or 296-307-41509.

- (15) Container safety-relief devices and regulator relief vents must be located at least five feet in any direction from air openings into sealed combustion system appliances or mechanical ventilation air intakes.

[Statutory Authority: Chapter 49.17.040 RCW. 98-24-096 (Order 98-13) § 296-307-41025, filed 12/01/98, effective 03/01/99. [Recodified as § 296-307-41025. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41025, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41027 How must indirect fired vaporizers be constructed and installed? Indirect fired vaporizers utilizing steam, water, or other heating medium must be constructed and installed according to the following:

- (1) Vaporizers must be constructed according to the requirements of WAC 296-307-41011 and must be permanently marked as follows:
- (a) With the code marking signifying the specifications to which the vaporizer is constructed;

WAC 296-307-41027 (Cont.)

- (b) With the allowable working pressure and temperature for which the vaporizer is designed;
 - (c) With the sum of the outside surface area and the inside heat exchange surface area expressed in square feet; and
 - (d) With the name or symbol of the manufacturer.
- (2) Vaporizers with an inside diameter of six inches or less exempted by the ASME Unfired Pressure Vessel Code, Section VIII of the ASME Boiler and Pressure Vessel Code, 1968, must have a design pressure of at least 250 psig and need not be permanently marked.
 - (3) Heating or cooling coils installed inside a storage container are prohibited.
 - (4) Vaporizers may be installed in buildings, rooms, sheds, or lean-tos used exclusively for gas manufacturing or distribution, or in other light, noncombustible structures that are well ventilated near the floor line and roof.

Exception: When vaporizing and/or mixing equipment is in a structure not used exclusively for gas manufacturing or distribution, the structure or room must be separated from the remainder of the building. The separation must be a wall designed to withstand a static pressure of at least 100 pounds per square foot. This wall must have no openings or pipe or conduit passing through it. Such structure or room must have adequate ventilation and must have a roof or at least one exterior wall of lightweight construction.

- (5) All DOT vaporizers must have, at or near the discharge, a safety-relief valve providing an effective rate of discharge according to WAC 296-307-41025.
- (6) The heating medium lines into and out of the vaporizer must have a mechanism to prevent the flow of gas into the heat systems in the event of tube rupture in the vaporizer. Vaporizers must have an automatic means to prevent liquid from passing through the vaporizers to the gas discharge piping.
- (7) The device that supplies heat to produce steam, hot water, or other heat may be installed in a building, compartment, room, or lean-to ventilated near the floorline and roof to the outside. The device must be separated from all compartments or rooms containing LP-gas vaporizers, pumps, and central gas mixing devices by a wall designed to withstand a static pressure of at least 100 pounds per square foot. This wall must have no openings or pipes or conduit passing through it.

Exception: This requirement does not apply to the domestic water heaters that may supply heat for a vaporizer in a domestic system.

- (8) Gas-fired heating systems supplying heat exclusively for vaporization must have automatic safety devices to shut off the flow of gas to main burners, if the pilot light should fail.
- (9) Vaporizers may be an integral part of a fuel storage container directly connected to the liquid section or gas section or both.
- (10) Fusible plugs are prohibited on vaporizers.
- (11) Vaporizer houses must not have unprotected drains to sewers or sump pits.

[Statutory Authority: Chapter 49.17.040 RCW. 98-24-096 (Order 98-13) § 296-307-41027, filed 12/01/98, effective 03/01/99.
[Recodified as § 296-307-41027. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41027, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41029 How must atmospheric vaporizers be constructed and installed? Atmospheric vaporizers using heat from the ground or surrounding air must be installed as follows:

- (1) Buried underground; or
- (2) Located inside the building near where the pipe enters the building, if the capacity of the unit does not exceed one quart;
- (3) Vaporizers of less than one quart capacity heated by the ground or surrounding air, may be installed without safety-relief valves if tests show that the assembly is safe.

[Recodified as § 296-307-41029. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41029, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41031 How must direct gas-fired vaporizers be constructed and installed? Direct gas-fired vaporizers must be constructed, marked, and installed as follows:

- (1) According to the requirements of the *American Society of Mechanical Engineers Boiler and Pressure Vessel Code*, 1968, that apply to the maximum working conditions for which the vaporizer is designed.
- (2) With the name of the manufacturer; rated Btu input to the burner; the area of the heat exchange surface in square feet; the outside surface of the vaporizer in square feet; and the maximum vaporizing capacity in gallons per hour.
- (3) Vaporizers may be connected to the liquid section or the gas section of the storage container, or both. The container must have a manually operated valve in each connection that completely shuts off when desired, all flow of gas or liquid from container to vaporizer.
- (4) Vaporizers with a maximum capacity of 35 gallons per hour must be located at least 5 feet from container shut-off valves. Vaporizers more than 35 gallon capacity but a maximum of 100 gallons per hour must be located at least 10 feet from the container shut-off valves. Vaporizers having a capacity greater than 100 gallons per hour must be located at least 15 feet from container shut-off valves.
- (5) Vaporizers may be installed in buildings, rooms, housings, sheds, or lean-tos used exclusively for vaporizing or mixing of LP-gas. Vaporizing housing structures must be noncombustible, and well ventilated near the floorline and the highest point of the roof. When vaporizer and/or mixing equipment is located in a structure or room attached to or within a building, such structure or room must be separated from the remainder of the building by a wall designed to withstand a static pressure of at least 100 pounds per square foot. This wall must have no openings or pipes or conduit passing through it. The structure or room must have adequate ventilation, and a roof or at least one exterior wall of lightweight construction.
- (6) Vaporizers must have at or near the discharge, a safety-relief valve providing an effective rate of discharge according to WAC 296-307-41025. The relief valve must be located where it is not subjected to temperatures over 140°F.
- (7) Vaporizers must have suitable automatic means to prevent liquid passing from the vaporizer to the gas discharge piping of the vaporizer.
- (8) Vaporizers must have means for manually turning off the gas to the main burner and pilot.
- (9) Vaporizers must have automatic safety devices to shut off the flow of gas to main burners if the pilot light should fail. When the flow through the pilot exceeds 2,000 Btu per hour, the pilot also must have an automatic safety device to shut off the flow of gas to the pilot should the pilot flame be extinguished.

WAC 296-307-41031 (Cont.)

- (10) Pressure regulating and pressure reducing equipment located within 10 feet of a direct fired vaporizer must be separated from the open flame by an airtight noncombustible partition.
- (11) Except as provided in subsection (5) of this section, the following minimum distances must be maintained between direct fired vaporizers and the nearest important building, group of buildings, or line of adjoining property that may be built on:
 - (a) Ten feet for vaporizers with a vaporizing capacity of 15 gallons per hour or less;
 - (b) Twenty-five feet for vaporizers with a vaporizing capacity of 16-100 gallons per hour;
 - (c) Fifty feet for vaporizers with a vaporizing capacity over 100 gallons per hour.
- (12) Direct fired vaporizers must not raise the product pressure above the design pressure of the vaporizer equipment or above the pressure shown in the second column of Table U-8.
- (13) Fusible plugs are prohibited on vaporizers.
- (14) Vaporizers must not have unprotected drains to sewers or sump pits.
[Statutory Authority: Chapter 49.17.040 RCW. 98-24-096 (Order 98-13) § 296-307-41031, filed 12/01/98, effective 03/01/99.
[Recodified as § 296-307-41031. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41031, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41033 How must direct gas-fired tank heaters be constructed and installed? Direct gas-fired tank heaters must be constructed and installed as follows:

- (1) Direct gas-fired tank heaters, and tanks to which they are applied, must only be installed aboveground.
- (2) Tank heaters must be permanently marked with the name of the manufacturer, the rated Btu input to the burner, and the maximum vaporizing capacity in gallons per hour.
Note: Tank heaters may be an integral part of a fuel storage container directly connected to the container liquid section, or vapor section, or both.
- (3) Tank heaters must have a means for manually turning off the gas to the main burner and pilot.
- (4) Tank heaters must have an automatic safety device to shut off the flow of gas to main burners, if the pilot light should fail. When flow through pilot exceeds 2,000 Btu per hour, the pilot also must have an automatic safety device to shut off the flow of gas to the pilot should the pilot flame be extinguished.
- (5) Pressure regulating and pressure reducing equipment if located within ten feet of a direct fired tank heater must be separated from the open flame by a substantially airtight noncombustible partition.
- (6) The following minimum distances must be maintained between a storage tank heated by a direct fired tank heater and the nearest important building, group of buildings, or line of adjoining property that may be built on:
 - (a) Ten feet for storage containers of less than 500 gallons water capacity;
 - (b) Twenty-five feet for storage containers of 500-1,200 gallons water capacity;
 - (c) Fifty feet for storage containers of over 1,200 gallons water capacity.

WAC 296-307-41033 (Cont.)

- (7) No direct fired tank heater may raise the product pressure within the storage container over 75% of the pressure in the second column of Table U-8.

[Recodified as § 296-307-41033. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41033, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41035 How must dehydrators be constructed and installed? The vaporizer section of vaporizer-burners used for dehydrators or dryers must be located outdoors; they must be constructed and installed as follows:

- (1) Vaporizer-burners must have a minimum design pressure of 250 psig with a factor safety of five.
- (2) Manually operated positive shut-off valves must be located at the containers to shut off all flow to the vaporizer-burners.
- (3) Minimum distances between storage containers and vaporizer-burners must be as follows:

Water Capacity per Container (Gallons)	Minimum Distances (feet)
Less than 501	10
501 to 2,000	25
Over 2,000	50

- (4) The vaporizer section of vaporizer-burners must be protected by a hydrostatic relief valve. The relief valve must be located where it is not subjected to temperatures over 140°F. The start-to-discharge pressure setting must protect the components involved, and be at least 250 psig. The discharge must be directed upward and away from component parts of the equipment and away from operating personnel.
- (5) Vaporizer-burners must have means for manually turning off the gas to the main burner and pilot.
- (6) Vaporizer-burners must have automatic safety devices to shut off the flow of gas to the main burner and pilot in the event the pilot is extinguished.
- (7) Pressure regulating and control equipment must be located or protected so that the temperatures surrounding this equipment shall not exceed 140°F.

Exception: Equipment components may be used at higher temperatures if designed to withstand such temperatures.

- (8) Pressure regulating and control equipment when located downstream of the vaporizer must be designed to withstand the maximum discharge temperature of the vapor.
- (9) Fusible plugs are prohibited on the vaporizer section of vaporizer-burners.
- (10) Vaporizer coils or jackets must be made of ferrous metal or high temperature alloys.
- (11) Equipment utilizing vaporizer-burners must have automatic shut-off devices upstream and downstream of the vaporizer section connected so as to operate in the event of excessive temperature, flame failure, and, if applicable, insufficient airflow.

[Recodified as § 296-307-41035. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41035, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41037 What are the maximum filling densities?

- (1) **“Filling density”** means the percent ratio of the weight of the gas in a container to the weight of water the container will hold at 60°F. All containers shall be filled according to the filling densities shown in Table U-4.

TABLE U-4
Maximum Permitted Filling Density

Aboveground Containers			
Specific gravity at 60°F (15.6°C)	0 to 1,200 U.S. gals. (1,000 imp. gal. 4,500 liters) total water cap.	0 to 1,200 U.S. gals. (1,000 imp. gal. 4,500 liters) total water cap.	Underground containers, all capacities
	Percent	Percent	Percent
.496-.503	41	44	45
.504-.510	42	45	46
.511-.519	43	46	47
.520-.527	44	47	48
.528-.536	45	48	49
.537-.544	46	49	50
.545-.552	47	50	51
.553-.560	48	51	52
.561-.568	49	52	53
.569-.576	50	53	54
.577-.584	51	54	55
.585-.592	52	55	56
.593-.600	53	56	57

- (2) Any container including mobile cargo tanks and portable tank containers regardless of size or construction, shipped under DOT jurisdiction or constructed according to DOT specifications must be charged according to DOT requirements.
- (3) Exception: Portable containers not subject to DOT jurisdiction must be filled either by weight, or by volume using a fixed length dip tube gauging device.

[Recodified as § 296-307-41037. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41037, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41039 What requirements apply to LP-gas in buildings?

- (1) Vapor may be piped into buildings at pressures over 20 psig only if the buildings or separate areas thereof:
- (a) Are constructed according to this section;
 - (b) Are used exclusively to house equipment for vaporization, pressure reduction, gas mixing, gas manufacturing, or distribution, or to house internal combustion engines, industrial processes, research and experimental laboratories, or equipment and processes using such gas and having similar hazard;
 - (c) Are buildings, structures, or equipment under construction or undergoing major renovation.
- (2) Liquid may be permitted in buildings as follows:

WAC 296-307-41039 (Cont.)

- (a) In buildings, or separate areas of buildings, used exclusively to house equipment for vaporization, pressure reduction, gas mixing, gas manufacturing, or distribution, or to house internal combustion engines, industrial processes, research and experimental laboratories, or equipment and processes using such gas and having similar hazard; and when such buildings, or separate areas are constructed according to this section.
- (b) In buildings, structures, or equipment under construction or undergoing major renovation if the temporary piping meets the following conditions:
 - (i) Liquid piping inside the building meets the requirements of WAC 296-307-41021 and is a maximum of three-fourths iron pipe size. Copper tubing with an outside diameter of 3/4 inch or less may be used if it meets the requirements of Type K of Specifications for Seamless Water Tube, ANSI H23.1-1970 (ASTM B88-1969). (See Table U-2.) All such piping must be protected against construction hazards. Liquid piping inside buildings must be kept to a minimum. Such piping must be securely fastened to walls or other surfaces to provide adequate protection from breakage and located to subject the liquid line to the lowest ambient temperatures.
 - (ii) A shut-off valve must be installed in each intermediate branch line where it takes off the main line and must be readily accessible. A shut-off valve must also be placed at the appliance end of the intermediate branch line. Such shut-off valve must be upstream of any flexible connector used with the appliance.
 - (iii) Suitable excess flow valves must be installed in the container outlet line supplying liquid LP-gas to the building. A suitable excess flow valve must be installed immediately downstream of each shut-off valve. Excess flow valves must be installed where piping size is reduced and must be sized appropriately.
 - (iv) Hydrostatic relief valves must be installed according to WAC 296-307-41025(13).
 - (v) Using hose to carry liquid between the container and the building or at any point in the liquid line, except at the appliance connector, is prohibited.
 - (vi) Where flexible connectors are necessary for appliance installation, such connectors must be as short as practical and must meet the requirements of WAC 296-307-41021(4) or 296-307-41023.
 - (vii) Release of fuel when any section of piping or appliances is disconnected must be minimized by either of the following methods:
 - (A) Using an approved automatic quick-closing coupling (closing in both directions when coupled in the fuel line); or
 - (B) Closing the valve nearest to the appliance and allowing the appliance to operate until the fuel in the line is consumed.
 - (viii) See WAC 296-307-41509 for the conditions under which portable containers may be brought indoors.

[Statutory Authority: Chapter 49.17.040 RCW. 98-24-096 (Order 98-13) § 296-307-41039, filed 12/01/98, effective 03/01/99.
[Recodified as § 296-307-41039. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41039, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41041 What requirements apply to transfer of liquids? When transferring liquids, you must ensure that:

- (1) At least one attendant remains close to the transfer connection from the time the connections are first made until they are finally disconnected, during the transfer of the product.
- (2) Containers must be filled or used only upon authorization of the owner.
- (3) Containers manufactured according to DOT specifications authorized by DOT as a “single trip” or “nonrefillable container” must not be refilled or reused in LP-gas service.
- (4) Gas or liquid must not be vented to the atmosphere to assist in transferring contents of one container to another, except as provided in WAC 296-307-42509(4). A listed pump may use LP-gas in the vapor phase as a source of energy. The gas may be vented to the atmosphere at a rate not to exceed that from a No. 31 drill size opening, if venting and liquid transfer are located at least 50 feet from the nearest important building.
- (5) Filling fuel containers for industrial trucks or motor vehicles from industrial bulk storage containers must be performed at least ten feet from the nearest important masonry-walled building or at least twenty-five feet from the nearest important building or other construction and always at least 25 feet from any building opening.
- (6) Filling portable containers, containers mounted on skids, fuel containers on farm tractors, or similar applications, from storage containers used in domestic or commercial service, must be performed at least 50 feet from the nearest important building.
- (7) The filling connection and the vent from the liquid level gauges in containers, filled at point of installation, must be at least ten feet in any direction from air openings into sealed combustion system appliances or mechanical ventilation air intakes.
- (8) Fuel supply containers must be gauged and charged only in the open air or in buildings especially provided for that purpose.
- (9) Marketers and users must exercise precaution to ensure that only those gases for which the system is designed, examined, and listed, are employed in its operation, particularly with regard to pressures.
- (10) Pumps or compressors must be designed for use with LP-gas. When compressors are used they must normally take suction from the vapor space of the container being filled and discharge to the vapor space of the container being emptied.
- (11) Pumping systems, when equipped with a positive displacement pump, must include a recirculating device that limits the differential pressure on the pump under normal operating conditions to the maximum differential pressure rating of the pump. The discharge of the pumping system must be protected so that pressure is a maximum of 350 psig. If a recirculation system discharges into the supply tank and contains a manual shut-off valve, an adequate secondary safety recirculation system must be incorporated that has no means of rendering it inoperative. Manual shut-off valves in recirculation systems must be kept open except during an emergency or when repairs are being made to the system.
- (12) When necessary, unloading piping or hoses must have suitable bleeder valves for relieving pressure before disconnection.
- (13) Agricultural air moving equipment, including crop dryers, shall be shut down when supply containers are filling unless the air intakes and sources of ignition on the equipment are located 50 feet or more from the container.

WAC 296-307-41041 (Cont.)

- (14) Agricultural equipment employing open flames or equipment with integral containers, such as flame cultivators, weed burners, and tractors, must be shut down during refueling.

[Statutory Authority: Chapter 49.17.040 RCW. 98-24-096 (Order 98-13) § 296-307-41041, filed 12/01/98, effective 03/01/99. [Recodified as § 296-307-41041. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41041, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41043 Must workers be trained? Workers performing installation, removal, operation, and maintenance work must be properly trained in that function.

[Recodified as § 296-307-41043. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41043, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41045 What fire protection must be provided for LP-gas installations?

- (1) Open flames or other sources of ignition are prohibited in vaporizer rooms (except those housing direct-fired vaporizers), pumphouses, container charging rooms or other similar locations. Direct-fired vaporizers are prohibited in pumphouses or container charging rooms.

Note: LP-gas storage containers do not require lightning protection. Since LP-gas is contained in a closed system of piping and equipment, the system need not be electrically conductive or electrically bonded for protection against static electricity. (See NFPA No. 77-1972-1973, Recommended Practice for Static Electricity.)

- (2) Open flames (except as provided in subsection (1) of this section), cutting or welding, portable electric tools, and extension lights capable of igniting LP-gas, are prohibited within classified areas specified in Table U-5 unless the LP-gas facilities have been freed of all liquid and vapor, or special precautions observed under carefully controlled conditions.

[Recodified as § 296-307-41045. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41045, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41047 What electrical requirements apply to LP-gas installations?

- (1) Electrical equipment and wiring must be specified by and installed according to chapter 296-307 WAC Part T, for ordinary locations.
- (2) Fixed electrical equipment and wiring installed within classified areas must comply with Table U-5 and must be installed according to chapter 296-307 WAC Part T.

Exception: This provision does not apply to fixed electrical equipment at residential or commercial installations of LP-gas systems, LP-gas used as a motor fuel, or to LP-gas system installations on commercial vehicles.

WAC 296-307-41047 (Cont.)

TABLE U-5			
Part	Location	Extent of Classified Area ¹	Equipment suitable for Class I, Group D ²
A	Storage containers other than DOT cylinders	Within 15 feet in all directions from connections, except connections otherwise covered in this table	Division 2
B	Tank vehicles and tank car loading and unloading ³	Within 5 feet in all directions from connections regularly made or disconnected for product transfer	Division 1
		Beyond 5 feet but within 15 feet in all directions from a point where connections are regularly made or disconnected and within the cylindrical volume between the horizontal equator of the sphere and grade (See Figure H-1)	Division 2
C	Gauge vent openings other than those on DOT cylinders	Within 5 feet in all directions from point of discharge	Division 1
		Beyond 5 feet but within 15 feet in all directions from point of discharge	Division 2
D	Relief valve discharge other than those on DOT cylinders	Within direct path of discharge	Division 1 <i>Note: Fixed electrical equipment should not be installed</i>
		Within 5 feet in all directions from point of discharge	Division 1
		Beyond 5 feet but within 15 feet in all directions from point of discharge except within the direct path of discharge	Division 2
E	Pumps, compressors, gas-air mixers and vaporizers other than direct fired		
	Indoors without ventilation	Entire room and any adjacent room not separated by a gastight partition	Division 1
		Within 15 feet of the exterior side of any exterior wall or roof that is not vaportight or within 15 feet of any exterior opening	Division 2
	Indoors with adequate ventilation ⁴	Entire room and any adjacent room not separated by a gastight partition	Division 2
	Outdoors in open air at or above grade	Within 15 feet in all directions from this equipment and within the cylindrical volume between the horizontal equator of the sphere and grade (See Figure H-1)	Division 2

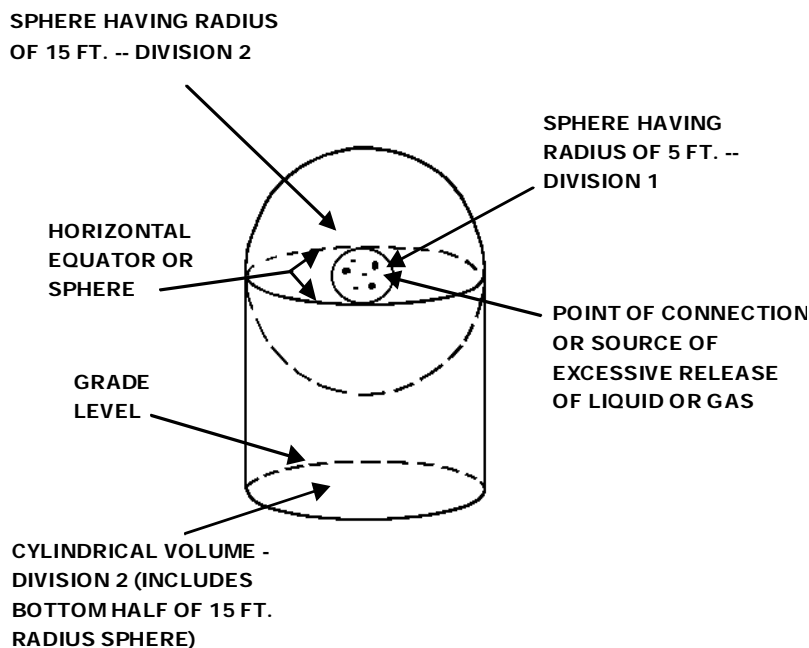
WAC 296-307-41047 (Cont.)

F	Service station dispensing units	Entire space within dispenser enclosure, and 18 inches horizontally from enclosure exterior up to an elevation 4 ft. above dispenser base. Entire pit or open space beneath dispenser.	Division 1
		Up to 18 inches above grade within 20 ft. horizontally from any edge of enclosure	Division 2
		<i>Note: For pits within this area, see Part F of this table</i>	
G	Pits or trenches containing or located beneath LP-gas valves, pumps, compressors, regulators, and similar equipment		
		Entire pit or trench	Division 1
		Entire room and any adjacent room not separated by a gastight partition	Division 2
	Without mechanical ventilation	Within 15 feet in all directions from pit or trench when located outdoors	Division 2
	With adequate mechanical ventilation	Entire pit or trench	Division 2
		Entire room and any adjacent room not separated by a gastight partition	Division 2
		Within 15 feet in all directions from pit or trench when located outdoors	
H	Special buildings or rooms for storage of portable containers	Entire room	Division 2
I	Pipelines and connections containing operational bleeds, drips, vents, or drains	Within 5 ft. in all directions from point of discharge	Division 1
		Beyond 5 ft. from point of discharge, same as Part E of this table	

WAC 296-307-41047 (Cont.)

J	Container filling		
	Indoors without ventilation	Entire room	Division 1
	Indoors with adequate ventilation ⁴	Within 5 feet in all directions from connections regularly made or disconnected for -product transfer	Division 1
		Beyond 5 feet and entire room	Division 2
	Outdoors in open air	Within 5 feet in all directions from connections regularly made or disconnected for product transfer	Division 1
		Beyond 5 feet but within 15 feet in all directions from a point where connections are regularly made or disconnected and within the cylindrical volume between teh horizontal equator of the sphere and grade (See Figure H-1)	Division 2
<div><div>¹The classified area must not extend beyond an unpierced wall, roof, or solid vaportight partition.</div><div>²See chapter 296-46 WAC, and chapter 296-307 WAC Part T.</div><div>³When classifying the extent of a hazardous area, consider the possible variations in the spotting of tank cars and tank vehicles at the unloading points and the effect these variations of actual spotting point may have on the point of connection.</div><div>⁴Ventilation, either natural or mechanical, is considered adequate when the concentration of the gas in a gas-air mixture does not exceed twenty-five percent of the lower flammable limit under normal operating conditions.</div></div>			

WAC 296-307-41047 (Cont.)



[Statutory Authority: Chapter 49.17.040 RCW. 98-24-096 (Order 98-13) § 296-307-41047, filed 12/01/98, effective 03/01/99. [Recodified as § 296-307-41047. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41047, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41049 What requirements apply to liquid-level gauging devices?

- (1) Each container manufactured after December 31, 1965, and filled on a volumetric basis must have a fixed liquid-level gauge to indicate the maximum permitted filling level according to subsection (5) of this section. Each container manufactured after December 31, 1969, must have permanently attached to the container adjacent to the fixed level gauge a marking showing the percentage full that will be shown by that gauge. When used with a variable liquid-level gauge, the fixed liquid-level gauge will act as a check on the variable gauge. Gauges must be used in charging containers as required in WAC 296-307-41034.
- (2) All variable gauging devices must be arranged so that the maximum liquid level for butane, for a 50/50 mixture of butane and propane, and for propane, to which the container may be charged, is easily determined. Liquid levels from empty to full must be marked on the system nameplate or gauging device. Dials of magnetic or rotary gauges must show whether they are for cylindrical or spherical containers and whether for aboveground or underground service. The dials of gauges for aboveground containers of over 1,200 gallons water capacity must be so marked.
- (3) Gauging devices that require bleeding of the product to the atmosphere, such as the rotary tube, fixed tube, and slip tube, shall be designed so that the bleed valve maximum opening is not larger than a No. 54 drill size, unless provided with excess flow valve.
- (4) Gauging devices must have a design working pressure of at least 250 psig.
- (5) Length of tube or position of fixed liquid-level gauge must be designed to indicate the maximum level to which the container may be filled for the product contained. This level shall be based on the volume of the product at 40°F at its maximum permitted filling density for aboveground containers and at 50°F for underground containers. You must calculate the filling point for which the fixed liquid level gauge must be designed according to this section.

WAC 296-307-41049 (Cont.)

Note: It is impossible to set out in a table the length of a fixed dip tube for various tank capacities because of the various tank diameters and lengths, and because the tank may be installed either vertically or horizontally. If you know the maximum permitted filling volume in gallons, however, you can determine the length of the fixed tube by using a strapping table from the container manufacturer.

The fixed tube should be long enough so that when its lower end touches the surface of the liquid in the container, the contents of the container will be the maximum permitted volume as determined by the following formula:

$$\frac{\text{Water capacity of container}^1 \text{ (gals.)} \times \text{filling density}^2}{\frac{\text{Specific gravity of LP-gas}^1 \times \text{volume correction factor}^3 \times 100}{\text{Maximum volume of LP-gas}}}$$

¹Measure at 60°F
²From WAC 296-307-41037(1)
³For aboveground containers the liquid temperature is assumed to be 40°F and for underground containers the liquid temperature is assumed to be 50°F. To correct the liquid volumes at these temperatures to 60°F, use the following factors:

- (a) To determine maximum volume of LP-gas for which a fixed length of dip tube must be set:

TABLE U-6 Volume Correction Factors		
Specific Gravity	Aboveground	Underground
0.500	1.033	1.017
.510	1.031	1.016
.520	1.029	1.015
.530	1.028	1.014
.540	1.026	1.013
.550	1.025	1.013
.560	1.024	1.012
.570	1.023	1.011
.580	1.021	1.011
.590	1.020	1.010

- (b) To calculate the maximum volume of LP-gas that can be placed in a container when determining the length of the dip tube expressed as a percentage of total water content of the container, use the formula in (c) of this subsection.
- (c) Determine the maximum weight of LP-gas that may be placed in a container for determining the length of a fixed dip tube by multiplying the maximum volume of LP-gas from Table U-6 by the pounds of LP-gas in a gallon at 40°F for aboveground and at 50°F for underground containers. Typical pounds per gallon are specified below:

WAC 296-307-41049 (Cont.)

Example: Assume a one hundred gallon total water capacity tank for aboveground storage of propane having a specific gravity of 0.510 of 60°F.

$$\begin{array}{rcl}
 100 \text{ (gals.)} \times 42 \text{ (filling density)} & & 4200 \\
 \hline
 & = & \\
 0.510 \times 1.031 \text{ (correction factor} & & 52.6 \\
 \text{from Table U-6)} \times 100 & & \\
 4200 & & 79.8 \text{ gallons propane, the maximum} \\
 \hline
 52.6 & = & \text{amount permitted to be placed in a} \\
 & & 100\text{-gallon total water capacity} \\
 & & \text{aboveground container equipped with} \\
 & & \text{a fixed dip tube.}
 \end{array}$$

$$\begin{array}{rcl}
 \text{Maximum volume of LP-gas (from} & & \\
 \text{formula in (a) of this subsection)} & & \\
 \times 100 & & \text{Maximum} \\
 \hline
 \text{Total water content of} & = & \text{percent} \\
 \text{container in gallons} & & \text{of LP-gas}
 \end{array}$$

	Aboveground, pounds per gallon	Underground, pounds per gallon
Propane	4.37	4.31
N Butane	4.97	4.92

- (6) Fixed liquid-level gauges used on non-DOT containers must be stamped on the exterior of the gauge with the letters DT followed by the vertical distance (expressed in inches and carried out to one decimal place) from the top of container to the end of the dip tube or to the centerline of the gauge when located at the maximum permitted filling level. For portable containers that may be filled in the horizontal and/or vertical position the letters DT must be followed by V with the vertical distance from the top of the container to the end of the dip tube for vertical filling, and with H followed by the proper distance for horizontal filling. For DOT containers the stamping must be placed both on the exterior of the gauge and on the container. On aboveground or cargo containers where the gauges are positioned at specific levels, the marking may be specified in percent of total tank contents and the marking must be stamped on the container.
- (7) Columnar gauge glasses must be restricted to charging plants where the fuel is withdrawn in the liquid phase only. They must have valves with metallic handwheels, excess flow valves, and extra-heavy glass adequately protected with a metal housing applied by the gauge manufacturer. They must be shielded against the direct rays of the sun. Columnar gauge glasses are prohibited on tank trucks, motor fuel tanks, and containers used in domestic, commercial, and industrial installations.
- (8) Float gauging devices or equivalent that do not require flow for their operation and that have connections extending outside the container do not have to have excess flow valves if the piping and fittings are adequately designed to withstand the container pressure and are properly protected against physical damage and breakage.

[Statutory Authority: Chapter 49.17.040 RCW. 98-24-096 (Order 98-13) § 296-307-41049, filed 12/01/98, effective 03/01/99.
[Recodified as § 296-307-41049. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41049, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41051 What requirements apply to appliances?

- (1) New commercial and industrial gas consuming appliances must be approved.

Exception: Any appliance that was originally manufactured for operation with a gaseous fuel other than LP-gas and is in good condition may be used with LP-gas only after it is properly converted, adapted, and tested for performance with LP-gas before the appliance is placed in use

- (2) Unattended heaters used inside buildings for the purpose of animal or poultry production or care must have an approved automatic device designed to shut off the flow of gas to the main burners, and pilot if used, in case the flame goes out.
- (3) All commercial, industrial, and agricultural appliances or equipment must be installed according to the requirements of these standards and according to the following:
- (a) Domestic and commercial appliances, NFPA 54-1969, Standard for the Installation of Gas Appliances and Gas Piping.
 - (b) Industrial appliances, NFPA 54A-1969, Standard for the Installation of Gas Piping and Gas Equipment on Industrial Premises and Certain Other Premises.
 - (c) Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines, NFPA 37-1970.
 - (d) Standard for the Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment, NFPA 96-1970.

[Recodified as § 296-307-41051. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41051, filed 10/31/96, effective 12/1/96.]

WAC 296-307-415 Cylinder systems.

[Recodified as § 296-307-415. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-415, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41501 What does this section cover? WAC 296-307-415 applies to systems using DOT containers. Cylinder systems must meet all requirements of WAC 296-307-410 (unless otherwise indicated) and the additional requirements of this section.

[Statutory Authority: Chapter 49.17.040 RCW. 98-24-096 (Order 98-13) § 296-307-41501, filed 12/01/98, effective 03/01/99. [Recodified as § 296-307-41501. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41501, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41503 What is a “cylinder system?” A “cylinder system” includes the container base or bracket, containers, container valves, connectors, manifold valve assembly, regulators, and relief valves.

[Recodified as § 296-307-41503. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41503, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41505 How must containers be marked for cylinder systems?

- (1) Containers must be marked according to DOT regulations. Additional markings that do not conflict with DOT regulations may be used.
- (2) Each container must be marked with its water capacity in pounds or other identified unit of weight.
- (3) Exception: If you are the only one who fills and maintains the container and if the water capacity of the container is identified by a code, subsection (2) of this section does not apply.

WAC 296-307-41505 (Cont.)

- (4) Each container must be marked with its tare weight in pounds or other identified unit of weight including all permanently attached fittings but not the cap.

[Recodified as § 296-307-41505. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41505, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41507 What additional requirements apply to cylinder systems installed outdoors?

- (1) Containers must not be buried below ground. However, systems may be installed in a compartment or recess below grade level, such as a niche in a slope or terrace wall that is used for no other purpose, if the container and regulating equipment are not in contact with the ground, and the compartment or recess is drained and ventilated horizontally to the outside air from its lowest level, with the outlet at least 3 feet away from any building opening below the level of the outlet.
- (2) Except as provided in WAC 296-307-41025(14), the discharge from safety-relief devices must be located at least three feet away from any building opening that is below the level of discharge and must not terminate beneath any building unless the space is well ventilated to the outside and is not enclosed on more than two sides.
- (3) Containers must be set on firm foundation or otherwise firmly secured; the possible effect of settling on the outlet piping must be guarded against by a flexible connection or special fitting.

[Statutory Authority: Chapter 49.17.040 RCW. 98-24-096 (Order 98-13) § 296-307-41507, filed 12/01/98, effective 03/01/99. [Recodified as § 296-307-41507. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41507, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41509 What additional requirements apply to cylinder system installed indoors?

- (1) When portable containers are necessary and it is not practical to use them outdoors, containers and equipment may be used indoors only if they meet the requirements of this section.
- (a) **“Containers in use”** means connected for use.
- (b) Systems using containers with a water capacity greater than 2-1/2 pounds (nominal one pound LP-gas capacity) must have excess flow valves. Such excess flow valves must be either integral with the container valves or in the connections to the container valve outlets. In either case, an excess flow valve must be installed so that any strain beyond the excess flow valve will not cause breakage between the container and the excess flow valve. The installation of excess flow valves must take into account the type of valve protection provided.
- (c) Regulators must be either directly connected to the container valves or to manifolds connected to the container valves. The regulator must be suitable for use with LP-gas. Manifolds and fittings connecting containers to pressure regulator inlets must be designed for at least 250 psig service pressure.
- (d) Valves on containers having a water capacity greater than fifty pounds (nominal twenty pounds LP-gas capacity) must be protected while in use.
- (e) Aluminum pipe or tubing is prohibited.
- (f) Hose must be designed for a working pressure of at least 250 psig. Hose and hose connections shall be listed by a nationally recognized testing laboratory.
- (i) Hose must be as short as practical.

WAC 296-307-41509 (Cont.)

- (ii) Hose must be long enough to allow required spacing without kinking, straining, or allowing hose to be close enough to a burner to be damaged by heat.
- (g) Portable heaters, including salamanders, must have an approved automatic device to shut off the flow of gas to the main burner, and pilot if used, in case the flame goes out. Heaters with inputs above 50,000 Btu manufactured on or after May 17, 1967, and heaters with inputs above 100,000 Btu manufactured before May 17, 1967, must have either:
 - (i) A pilot that must be lighted and proved before the main burner can be turned on; or
 - (ii) An electric ignition system;
 - (iii) Container valves, connectors, regulators, manifolds, piping, and tubing must not be used as structural supports for heaters.

Exception: These requirements do not apply to tar kettle burners, torches, melting pots, nor do they apply to portable heaters under 7,500 Btu/h input when used with containers with a maximum water capacity of 2-1/2 pounds.

- (h) Containers, regulating equipment, manifolds, piping, tubing, and hose must be located to minimize exposure to abnormally high temperatures (such as may result from exposure to convection or radiation from heating equipment or installation in confined spaces), physical damage, or tampering.
 - (i) Heat producing equipment must be located and used to minimize the possibility of igniting combustibles.
 - (j) Containers with water capacity greater than 2-1/2 pounds (nominal one pound LP-gas capacity) connected for use, must stand on a firm and substantially level surface and, when necessary, must be secured in an upright position.
 - (k) Containers, including the valve protective devices, must be installed to minimize the probability of impingement of discharge of safety-relief devices upon containers.
- (2) Containers with a maximum water capacity of 2-1/2 pounds (nominal one pound LP-gas capacity) may be used indoors as part of approved self-contained hand torch assemblies or similar appliances.
 - (3) When buildings frequented by the public are open to the public, containers may be used for repair or minor renovation as follows:
 - (a) The maximum water capacity of individual containers must be 50 pounds (nominal twenty pounds LP-gas capacity).
 - (b) The number of LP-gas containers must not exceed the number of employees assigned to use LP-gas.
 - (c) Containers with a water capacity greater than 2-1/2 pounds (nominal one pound LP-gas capacity) must be attended at all times.
 - (4) When buildings frequented by the public are closed to the public, containers may be used in buildings or structures for repairs or minor renovation as follows:

WAC 296-307-41509 (Cont.)

- (a) The maximum water capacity of individual containers must be 245 pounds (nominal one hundred pounds LP-gas capacity).
 - (b) For temporary heating such as curing concrete, drying plaster and similar applications, heaters (other than integral heater-container units) must be located at least six feet from any LP-gas container. You may use heaters specifically designed for attachment to the container or to a supporting standard, if they are designed and installed to prevent direct or radiant heat application from the heater onto the container. Blower and radiant type heater must not be directed toward any LP-gas container within 20 feet.
 - (c) If two or more heater-container units are located in an unpartitioned area on the same floor, the container or containers of each unit must be separated from the container or containers of any other unit by at least 20 feet.
 - (d) When heaters are connected to containers for use in an unpartitioned area on the same floor, the total water capacity of containers manifolded together for connection to a heater or heaters shall not be greater than 735 pounds (nominal three hundred pounds LP-gas capacity). Such manifolds must be separated by at least 20 feet.
 - (e) On floors on which heaters are not connected for use, containers may be manifolded together for connection to a heater or heaters on another floor, if:
 - (i) The total water capacity of containers connected to any one manifold is a maximum of 2,450 pounds (nominal one thousand pounds LP-gas capacity) and;
 - (ii) Where more than one manifold having a total water capacity greater than 735 pounds (nominal three hundred pounds LP-gas capacity) are located in the same unpartitioned area, they shall be separated by at least 50 feet.
 - (f) Containers with a water capacity greater than 2-1/2 pounds (nominal one pound LP-gas capacity) must be attended at all times.
- (5) Containers may be used in industrial occupancies for processing, research, or experimental purposes as follows:
- (a) The maximum water capacity of individual containers must be 245 pounds (nominal one hundred pounds LP-gas capacity).
 - (b) Containers connected to a manifold must have a total water capacity of a maximum of 735 pounds (nominal three hundred pounds LP-gas capacity) and only one manifold may be located in the same room unless separated at least 20 feet from a similar unit.
 - (c) LP-gas in containers for research and experimental use must use the smallest practical quantity.
- (6) Containers used in industrial occupancies with essentially noncombustible contents where portable equipment for space heating is essential and where a permanent heating installation is not practical, must meet the requirements of subsection (5) of this section.
- (7) Containers may be used in buildings for temporary emergency heating purposes, if necessary to prevent damage to the buildings or contents, when the permanent heating system is temporarily out of service, as follows:

WAC 296-307-41509 (Cont.)

- (a) Containers and heaters must meet the requirements of subsection (5) of this section.
- (b) The temporary heating equipment must be attended at all times.
- (8) Containers may be used temporarily in buildings for training purposes related in installation and use of LP-gas systems, as follows:
 - (a) The maximum water capacity of individual containers must be 245 pounds (nominal one hundred pounds LP-gas capacity), but the maximum quantity of LP-gas that may be placed in each container is 20 pounds.
 - (b) If more than one container is located in the same room, the containers must be separated by at least 20 feet.
 - (c) Containers must be removed from the building when the training class has terminated.

[Recodified as § 296-307-41509. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41509, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41511 What requirements apply to valves and accessories?

- (1) Valves in the assembly of multiple container systems must be arranged so that containers can be replaced without shutting off the flow of gas in the system.

Note: An automatic changeover device is not required.

- (2) Regulators and low-pressure relief devices must be rigidly attached to the cylinder valves, cylinders, supporting standards, the building walls or otherwise rigidly secured and must be installed or protected so that weather will not affect their operation.
- (3) Valves and connections to the containers must be protected while in transit, in storage, and while being moved into final use, as follows:
 - (a) By setting into the recess of the container to prevent the possibility of being struck if the container is dropped on a flat surface; or
 - (b) By ventilated cap or collar, fastened to the container capable of withstanding a blow from any direction equivalent to that of a 30-pound weight dropped four feet. Construction must ensure that a blow will not be transmitted to the valve or other connection.
- (4) When containers are not connected to the system, the outlet valves must be kept tightly closed or plugged, even on empty containers.
- (5) Containers having a water capacity in excess of 50 pounds (approximately 21 pounds LP-gas capacity), recharged at the installation, must have excess flow or backflow check valves to prevent the discharge of container contents in case of failure of the filling or equalizing connection.

[Recodified as § 296-307-41511. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41511, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41513 What requirements apply to safety devices for cylinder systems?

- (1) Containers must have safety devices as required by DOT regulations.
- (2) A final stage regulator of an LP-gas system (excluding any appliance regulator) must have, on the low-pressure side, a relief valve that is set to start to discharge within the limits specified in Table U-7.

WAC 296-307-41513 (Cont.)

TABLE U-7 Relief valve start-to-discharge pressure setting (percent of regulator delivery pressure)		
Regulator delivery pressure	Minimum	Maximum
1 psig or less	200	300
Above 1 psig but not over 3 psig	140	200
Above 3 psig	125	200

- (3) When a regulator or pressure relief valve is used indoors for other than purposes specified in WAC 296-307-41017(1), the relief valve and the space above the regulator and relief valve diaphragms shall be vented to the outside air with the discharge outlet located at least three feet horizontally away from any building opening that is below such discharge.

Exception: This requirement does not apply to individual appliance regulators when protection is otherwise provided, nor to WAC 296-307-41509 and 296-307-41025(14). In buildings devoted exclusively to gas distribution, the space above the diaphragm need not be vented to the outside.

[Statutory Authority: Chapter 49.17.040 RCW. 98-24-096 (Order 98-13) § 296-307-41513, filed 12/01/98, effective 03/01/99.
[Recodified as § 296-307-41513. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41513, filed 10/31/96, effective 12/1/96.]

WAC 296-307-41515 What other requirements apply to cylinder systems?

- (1) Containers must not be reinstalled unless they are requalified according to DOT regulations.
- (2) A product must not be placed in a container marked with a service pressure less than four-fifths of the maximum vapor pressure of product at 130°F.

[Recodified as § 296-307-41515. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-41515, filed 10/31/96, effective 12/1/96.]

WAC 296-307-420 Systems using non-DOT containers.

[Recodified as § 296-307-420. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-420, filed 10/31/96, effective 12/1/96.]

WAC 296-307-42001 What does this section cover? WAC 296-307-420 applies to systems using storage containers not constructed according to DOT specifications. Non-DOT containers must meet all requirements of WAC 296-307-410 (unless otherwise indicated) and the additional requirements of this section.

[Statutory Authority: Chapter 49.17.040 RCW. 98-24-096 (Order 98-13) § 296-307-42001, filed 12/01/98, effective 03/01/99.
[Recodified as § 296-307-42001. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-42001, filed 10/31/96, effective 12/1/96.]

WAC 296-307-42003 How must non-DOT containers be designed and classified? Storage containers must be designed and classified according to Table U-8.

WAC 296-307-42003 (Cont.)

TABLE U-8			
Minimum design pressures of container lb. per sp. in. gauge			
Container Type	For gases with vapor pressure not to exceed 1b. per sp. in. gauge 100°F (37.8°C.)	1949 and earlier editions of ASME Code (Par. U-68, U-69)	1949 edition of Code (Par. U-200, U-201); 1950, 1952, 1956, 1959, 1962, 1965, and 1968 (Division 1) editions of ASME Code; All editions of API-ASME Code ³
80 ¹	80 ¹	80 ¹	100 ¹
100	100	100	125
125	125	125	156
150	150	150	187
175	175	175	219
200 ²	215	200	250

¹New type 80 storage containers have not been authorized since Dec. 31, 1947.
²Container type may be increased by increments of 25. The minimum design pressure of containers shall be 100% of the container type designations when constructed under 1949 or earlier editions of the ASME Code (Par. U-68 and U-69). The minimum design pressure of containers shall be 125% of the container type designation when constructed under:

1. The 1949 ASME Code (Par. U-200 and U-201);
2. 1950, 1952, 1956, 1959, 1962, 1965, and 1968 (Division 1) editions of ASME Code; and
3. All editions of the API-ASME Code.

³Construction of containers under the API-ASME Code is prohibited after July 1, 1961.

[Recodified as § 296-307-42003. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-42003, filed 10/31/96, effective 12/1/96.]

WAC 296-307-42005 What requirements apply to valves and accessories, filler pipes, and discharge pipes for non-DOT containers?

- (1) The filling pipe inlet terminal must not be located inside a building. For containers with a water capacity of 125 gallons or more, such terminals must be located at least 10 feet from any building, and preferably at least 5 feet from any driveway, and must have a protective housing.
- (2) The filling connection must be fitted with one of the following:
 - (a) Combination back-pressure check valve and excess flow valve.
 - (b) One double or two single back-pressure check valves.
 - (c) A positive shut-off valve in conjunction with either:
 - (i) An internal back pressure valve; or

WAC 296-307-42005 (Cont.)

- (ii) An internal excess flow valve.
- (3) All openings in a container must have approved automatic excess flow valves unless otherwise exempt.
- (4) An excess flow valve is not required in the withdrawal service line if the following requirements are met:
 - (a) The total water capacity is a maximum of 2,000 U.S. gallons.
 - (b) The discharge from the service outlet is controlled by a manually operated shut-off valve that is:
 - (i) Threaded directly into the service outlet of the container; or
 - (ii) Is an integral part of a substantial fitting threaded into or on the service outlet of the container; or
 - (iii) Threaded directly into a substantial fitting threaded into or on the service outlet of the container.
 - (c) The shut-off valve is equipped with an attached handwheel or the equivalent.
 - (d) The controlling orifice between the contents of the container and the outlet of the shut-off valve is a maximum of 5/16 inch in diameter for vapor withdrawal systems and 1/8 inch in diameter for liquid withdrawal systems.
 - (e) An approved pressure-reducing regulator is directly attached to the outlet of the shut-off valve and is rigidly supported, or an approved pressure-reducing regulator is attached to the outlet of the shut-off valve by means of a suitable flexible connection, if the regulator is adequately supported and properly protected on or at the tank.
- (5) All inlet and outlet connections except safety-relief valves, liquid-level gauging devices and pressure gauges on containers of 2,000 gallons water capacity, or more, and on any container used to supply fuel directly to an internal combustion engine, must be labeled to designate whether they communicate with vapor or liquid space. Labels may be on valves.
- (6) Instead of an excess flow valve, openings may be fitted with a quick-closing internal valve that must remain closed when not in operation. The internal mechanism for such valves may have a secondary control that must have a fusible plug (not over 220°F melting point) that will cause the internal valve to close automatically in case of fire.
- (7) A maximum of two plugged openings may be used on a container of 2,000 gallons or less water capacity.
- (8) Containers of 125 gallons water capacity or more manufactured after July 1, 1961, must have an approved device for liquid evacuation, the size of which must be 3/4 inch national pipe thread minimum. A plugged opening does not satisfy this requirement.

[Recodified as § 296-307-42005. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-42005, filed 10/31/96, effective 12/1/96.]

WAC 296-307-42007 What additional requirements apply to safety devices for non-DOT containers?

- (1) All safety devices must comply with the following:
- (a) All container safety-related devices must be located on the containers.
 - (b) In industrial and gas manufacturing plants, discharge pipe from safety-relief valves on pipe lines within a building must discharge upward and be piped to a point outside a building.
 - (c) Safety-relief device discharge terminals must be located to provide against physical damage and must be fitted with loose raincaps. Return bends and restrictive pipefittings are prohibited.
 - (d) If desired, discharge lines from two or more safety-relief devices located on the same unit, or similar lines from two or more different units, may be run into a common discharge header, if the cross-sectional area of the header is at least equal to the sum of the cross-sectional area of the individual discharge lines, and the setting of safety-relief valves are the same.
 - (e) Each storage container of over 2,000 gallons water capacity must have a suitable pressure gauge.
 - (f) A final stage regulator of an LP-gas system (excluding any appliance regulator) must have, on the low-pressure side, a relief valve that is set to start to discharge within the limits specified in Table U-7.
 - (g) When a regulator or pressure relief valve is installed indoors, the relief valve and the space above the regulator and relief valve diaphragms must be vented to the outside air with the discharge outlet located not less than 3 feet horizontally away from any opening into the building that is below such discharge.

Exception: This requirement does not apply to individual appliance regulators already protected. In buildings devoted exclusively to gas distribution, the space above the diaphragm need not be vented to the outside.

- (2) Safety devices for aboveground containers must be provided as follows:
- (a) Containers of 1,200 gallons water capacity or less that may contain liquid fuel when installed aboveground must have the rate of discharge required by WAC 296-307-41025(2) provided by a spring-loaded relief valve or valves. In addition to the required spring-loaded relief valve, a suitable fuse plug may be used if the total discharge area of the fuse plug for each container does not exceed 0.25 square inch.
 - (b) The fusible metal of the fuse plugs must have a yield temperature of 208°F minimum and 220°F maximum. Relief valves and fuse plugs must have direct communication with the vapor space of the container.
 - (c) On a container having a water capacity between 125 and 2,000 gallons, the discharge from the safety-relief valves must be vented away from the container upwards and unobstructed to the open air so that it prevents any impingement of escaping gas upon the container; loose-fitting rain caps shall be used. Suitable provision must be made for draining condensate that may accumulate in the relief valve or its discharge pipe.
 - (d) On containers of 125 gallons water capacity or less, the discharge from safety-relief devices must be located at least 5 feet horizontally away from any opening into the building below the level of such discharge.

WAC 296-307-42007 (Cont.)

- (e) On a container having a water capacity greater than 2,000 gallons, the discharge from the safety-relief valves must be vented away from the container upwards to a point at least 7 feet above the container, and unobstructed to the open air so that it prevents any impingement of escaping gas upon the container; loose-fitting rain caps shall be used. Suitable provision must be made so that any liquid or condensate that may accumulate inside of the safety-relief valve or its discharge pipe will not render the valve inoperative. If a drain is used, the container, adjacent containers, piping, or equipment must be protected against impingement of flame resulting from ignition of product escaping from the drain.
- (3) On all containers that are installed underground and that contain no liquid fuel until buried and covered, the rate of discharge of the spring-loaded relief valve installed thereon may be reduced to a minimum of 30% of the rate of discharge specified in WAC 296-307-41025(2). Containers so protected must remain covered after installation until the liquid fuel has been removed. Containers that may contain liquid fuel before being installed underground and before being completely covered with earth are aboveground containers when determining the rate of discharge requirement of the relief valves.
- (4) On underground containers of over 2,000 gallons water capacity, the discharge from safety-relief devices must be piped directly upward to a point at least 7 feet above the ground.
- (5) Where the manhole or housing may become flooded, the discharge from regulator vent lines must be above the highest probable water level. All manholes or housings must have ventilated louvers or equivalent, and the area of openings must be equal to or exceed the combined discharge areas of the safety-relief valves and other vent lines that discharge their content into the manhole housing.
- (6) Safety devices for vaporizers must be provided as follows:
 - (a) Vaporizers of less than 1 quart total capacity, heated by the ground or the surrounding air, need not have safety-relief valves if adequate tests demonstrate that the assembly is safe without safety-relief valves.
 - (b) Fusible plugs are prohibited on vaporizers.
 - (c) In industrial and gas manufacturing plants, safety-relief valves on vaporizers within a building must be piped to a point outside the building and be discharged upward.

[Statutory Authority: Chapter 49.17.040 RCW. 98-24-096 (Order 98-13) § 296-307-42007, filed 12/01/98, effective 03/01/99.
[Recodified as § 296-307-42007. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-42007, filed 10/31/96, effective 12/1/96.]

WAC 296-307-42009 When may non-DOT containers be reinstalled? Containers may be reinstalled if they are free from harmful external corrosion or other damage. Where containers are reinstalled underground, the corrosion resistant coating must be put in good condition. Where containers are reinstalled aboveground, the safety devices and gauging devices must meet all requirements for aboveground containers.

[Recodified as § 296-307-42009. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-42009, filed 10/31/96, effective 12/1/96.]

WAC 296-307-42011 What is the maximum capacity allowed for non-DOT containers? A non-DOT storage container must have a maximum 90,000 gallons water capacity.

[Recodified as § 296-307-42011. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-42011, filed 10/31/96, effective 12/1/96.]

WAC 296-307-42013 How must non-DOT containers be installed?

- (1) Containers installed aboveground must have substantial masonry or noncombustible structural supports on firm masonry foundation, unless otherwise indicated.
- (2) Aboveground containers must be supported as follows:
 - (a) Horizontal containers must be mounted on saddles that permit expansion and contraction. Structural metal supports may be used when they are protected against fire. Suitable means of preventing corrosion must be provided on that portion of the container in contact with the foundations or saddles.
 - (b) Containers of 2,000 gallons water capacity or less may be installed with nonfireproofed ferrous metal supports if mounted on concrete pads or footings, and if the distance from the outside bottom of the container shell to the concrete pad, footing, or the ground is a maximum of 24 inches.
- (3) Any container may be installed with nonfireproofed ferrous metal supports if mounted on concrete pads or footings, and if the distance from the outside bottom of the container to the ground is a maximum of 5 feet, if the container is in an isolated location.
- (4) Partially buried containers must meet the following requirements:
 - (a) The portion of the container below the surface and for a vertical distance not less than 3 inches above the surface of the ground is protected to resist corrosion, and the container is protected against settling and corrosion as required for fully buried containers.
 - (b) Partially buried containers must meet the same spacing requirements as underground tanks.
 - (c) Relief valve capacity must be the same as for aboveground containers.
 - (d) Container is protected against vehicular damage by location or other means.
 - (e) Partially buried containers must meet the same requirements for filling densities as for aboveground containers.
- (5) Containers buried underground must be placed so that the top of the container is at least 6 inches below grade. Underground containers subject to abrasive action or physical damage must be:
 - (a) Placed not less than 2 feet below grade; or
 - (b) Otherwise protected against such physical damage.

It is not necessary to cover the portion of the container to which manhole and other connections are affixed. When necessary to prevent floating, containers must be securely anchored or weighted.
- (6) Containers must be given a protective coating before being placed underground. This coating must be equivalent to hot-dip galvanizing or to two coatings of red lead followed by a heavy coating of coal tar or asphalt. In lowering the container into place, take care to prevent damage to the coating. Any damage to the coating must be repaired before backfilling.

WAC 296-307-42013 (Cont.)

Containers must be set on a firm foundation (firm earth may be used) and surrounded with earth or sand firmly tamped in place. Backfill should be free of rocks or other abrasive materials.

- (7) Containers with foundations attached (portable or semiportable containers with suitable steel runners or skids popularly known as "skid tanks") must meet the requirements of WAC 296-307-410 and the following:
- (a) If they are to be used at a given general location for a temporary period of 6 months at most, they may be without fire-resisting foundations or saddles but must have adequate ferrous metal supports.
 - (b) They must not be located with the outside bottom of the container shell more than 5 feet above the surface of the ground unless fire-resisting supports are provided.
 - (c) The bottom of the skids must be between 2 and 12 inches below the outside bottom of the container shell.
 - (d) Flanges, nozzles, valves, fittings, and the like, having communication with the interior of the container, must be protected against physical damage.
 - (e) When not permanently located on fire-resisting foundations, piping connections must be flexible enough to minimize breakage or leakage of connections if the container settles, moves, or is otherwise displaced.
 - (f) Skids, or lugs for attachment of skids, must be secured to the container according to the rules under which the container is designed and built (with a minimum factor of safety of four) to withstand loading in any direction equal to four times the weight of the container and attachments when filled to the maximum permissible loaded weight.
- (8) Field welding where necessary must be made only on saddle plates or brackets that were applied by the manufacturer of the tank.
- (9) For aboveground containers, secure anchorage or adequate pier height must be provided against possible container flotation wherever high floodwater might occur.
- (10) When permanently installed containers are interconnected, you must allow for expansion, contraction, vibration, and settling of containers, and interconnecting piping. Where flexible connections are used, they must be approved and designed for a bursting pressure of at least five times the vapor pressure of the product at 100°F. Nonmetallic hose is prohibited for permanently interconnecting containers.
- (11) Container assemblies listed for interchangeable installation aboveground or underground must meet the requirements for aboveground installations for safety-relief capacity and filling density. For installation aboveground all other requirements for aboveground installations apply. For installation underground all other requirements for underground installations apply.

[Statutory Authority: Chapter 49.17.040 RCW. 98-24-096 (Order 98-13) § 296-307-42013, filed 12/01/98, effective 03/01/99. [Recodified as § 296-307-42013. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-42013, filed 10/31/96, effective 12/1/96.]

WAC 296-307-42015 How must non-DOT containers be protected?

- (1) Valves, regulating, gauging, and other container accessory equipment must be protected against tampering and physical damage. Such accessories must also be protected during the transit of containers intended for installation underground.

WAC 296-307-42015 (Cont.)

- (2) On underground or combination aboveground-underground containers, the service valve handwheel, the terminal for connecting the hose, and the opening through which there can be a flow from safety-relief valves must be at least 4 inches above the container and this opening must be located in the dome or housing. Underground systems must be installed so that all openings, including the regulator vent, are located above the normal maximum water table.
- (3) All connections to the underground containers must be located within a substantial dome, housing, or manhole, with access protected by a substantial cover.

[Recodified as § 296-307-42015. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-42015, filed 10/31/96, effective 12/1/96.]

WAC 296-307-42017 What requirements apply to non-DOT containers in industrial plants? General provisions applicable to systems in industrial plants (of 2,000 gallons water capacity and more) and to bulk filling plants.

- (1) When standard watch service is provided, it must be extended to the LP-gas installation and personnel shall be properly trained.
- (2) If loading and unloading are normally done during the night, adequate lights must be provided to illuminate storage containers, control valves, and other equipment.
- (3) Suitable roadways or means of access for extinguishing equipment such as wheeled extinguishers or fire department apparatus must be provided.
- (4) To minimize trespassing or tampering, the area that includes container accessories, pumping equipment, loading and unloading facilities, and cylinder-filling facilities must be enclosed with at least a 6-foot-high industrial fence unless otherwise adequately protected. There must be at least two means of emergency access.

[Recodified as § 296-307-42017. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-42017, filed 10/31/96, effective 12/1/96.]

WAC 296-307-42019 What requirements apply to container-charging plants?

- (1) The container-charging room must be located at least:
 - (a) Ten feet from bulk storage containers.
 - (b) Twenty-five feet from line of adjoining property that may be built on.
- (2) Tank truck filling station outlets must be located at least:
 - (a) Twenty-five feet from line of adjoining property that may be built on.
 - (b) Ten feet from pumps and compressors if housed in one or more separate buildings.
- (3) The pumps or compressors may be located in the container-charging room or building, in a separate building, or outside of buildings. When housed in separate building, such building (a small noncombustible weather cover is not to be construed as a building) must be located at least:
 - (a) Ten feet from bulk storage tanks.
 - (b) Twenty-five feet from line of adjoining property that may be built on.

WAC 296-307-42019 (Cont.)

- (c) Twenty-five feet from sources of ignition.
- (4) When a part of the container-charging building is to be used for a boiler room or where open flames or similar sources of ignition exist or are employed, the space to be occupied must be separated from container charging room by a partition wall or walls of fire-resistant construction continuous from floor to roof or ceiling. Such separation walls must be without openings and must be joined to the floor, other walls, and ceiling or roof to provide a permanent gas-tight joint.

[Recodified as § 296-307-42019. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-42019, filed 10/31/96, effective 12/1/96.]

WAC 296-307-42021 What fire protection must be provided for non-DOT containers?

- (1) Each bulk plant must have at least 1 approved portable fire extinguisher with a minimum rating of 12-B, C.
- (2) In industrial installations involving containers of 150,000 gallons aggregate water capacity or more, you must provide an adequate supply of water at the container site for fire protection in the container area, unless other adequate means for fire control are provided. Water hydrants must be readily accessible and spaced to provide water protection for all containers. Enough firehose must be provided to facilitate easy movement of the hose in the container area. You should equip the outlet of each hose line with a combination fog nozzle. A shelter must be provided to protect the hose and its conveyor from the weather.

[Recodified as § 296-307-42021. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-42021, filed 10/31/96, effective 12/1/96.]

WAC 296-307-42023 What other requirements apply to non-DOT containers?

- (1) Aboveground containers must be kept properly painted.
- (2) Vaporizers for internal combustion engines must meet the requirements of WAC 296-307-42515.
- (3) Gas regulating and mixing equipment for internal combustion engines must meet the requirements of WAC 296-307-42517.
- (4) Where vaporized gas on the low-pressure side of the system may condense to a liquid at normal operating temperatures and pressures, means must be provided to revaporize condensate.
- (5) You must protect LP-gas systems against damage from vehicular traffic.
- (6) Avoid the use of pits when possible, except pits fitted with automatic flammable vapor detecting devices. No drains or blowoff lines must be directed into or in proximity to sewer systems used for other purposes.

[Statutory Authority: Chapter 49.17.040 RCW. 98-24-096 (Order 98-13) § 296-307-42023, filed 12/01/98, effective 03/01/99. [Recodified as § 296-307-42023. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-42023, filed 10/31/96, effective 12/1/96.]

WAC 296-307-425 LP-gas as a motor fuel.

[Recodified as § 296-307-425. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-425, filed 10/31/96, effective 12/1/96.]

WAC 296-307-42501 What does this section cover?

- (1) WAC 296-307-425 applies to internal combustion engines, fuel containers, and pertinent equipment for the use of LP-gases as a motor fuel on easily movable, readily portable units including self-propelled vehicles. This section does not apply to containers for transportation of LP-gases nor to marine fuel use.

WAC 296-307-42501 (Cont.)

- (2) All uses of LP-gas as a motor fuel must meet all requirements of WAC 296-307-410 (unless otherwise indicated) and the additional requirements of this section.

[Statutory Authority: Chapter 49.17.040 RCW. 98-24-096 (Order 98-13) § 296-307-42501, filed 12/01/98, effective 03/01/99. [Recodified as § 296-307-42501. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-42501, filed 10/31/96, effective 12/1/96.]

WAC 296-307-42503 What general requirements apply to LP-gas used as a motor fuel?

- (1) Fuel may be used from the cargo tank of a truck while in transit, but not from cargo tanks on trailers or semitrailers. Fuel may be used from the cargo tanks to operate stationary engines if the wheels are securely blocked.
- (2) Passenger-carrying vehicles must not be fueled while passengers are on board.
- (3) Industrial trucks (including lift trucks) equipped with permanently mounted fuel containers must be charged outdoors. Charging equipment must meet the requirements of WAC 296-307-440.
- (4) LP-gas fueled industrial trucks must comply with the Standard for Type Designations, Areas of Use, Maintenance and Operation of Powered Industrial Trucks, NFPA 505-1969.
- (5) Engines on vehicles must be shut down while fueling if the fueling operation involves venting to the atmosphere.

[Statutory Authority: Chapter 49.17.040 RCW. 98-24-096 (Order 98-13) § 296-307-42503, filed 12/01/98, effective 03/01/99. [Recodified as § 296-307-42503. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-42503, filed 10/31/96, effective 12/1/96.]

WAC 296-307-42505 How must fuel containers be designed and classified?

- (1) Containers must meet the following requirements:

Minimum design pressures of container lb. per sq. in. gauge			
Container Type	For gases with vapor pressure not to exceed 1b. per sq. in. gauge at 100°F (37.8°C.)	1949 and earlier editions of ASME Code (Par. U-68, U-69)	1949 edition of ASME Code (Par. U-200, U-201); 1950, 1952, 1956, 1959, 1962, 1965, and 1968 (Division 1) editions of ASME Code; All editions of API-ASME Code ²
200 ¹	215	200	250
¹ Container type may be increased by increments of 25. The minimum design pressure of containers shall be 100% of the container type designations when constructed under 1949 or earlier editions of the ASME Code (Par. U-68 and U-69). The minimum design pressure of containers shall be 125% of the container type designation when constructed under: <ol style="list-style-type: none"> 1. The 1949 ASME Code (Par. U-200 and U-201); 2. 1950, 1952, 1956, 1959, 1962, 1965, and 1968 (Division 1) editions of ASME Code; and 3. All editions of the API-ASME Code. ² Construction of containers under the API-ASME Code is prohibited after July 1, 1961.			

WAC 296-307-42505 (Cont.)

Exception: Fuel containers for use in industrial trucks (including lift trucks) shall be either DOT containers authorized for LP-gas service having a minimum service pressure of 240 psig or minimum Container Type 250. Under 1950 and later ASME Codes, this means a 312.5-psig design pressure container.

- (2) DOT containers used as fuel containers must meet all requirements of this section.
- (3) All container inlets and outlets except safety-relief valves and gauging devices must be labeled to designate whether they communicate with vapor or liquid space. (Labels may be on valves.)

[Recodified as § 296-307-42505. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-42505, filed 10/31/96, effective 12/1/96.]

WAC 296-307-42507 How must fuel containers be installed?

- (1) Containers must be located to minimize the possibility of damage to the container. Containers located in the rear of trucks and buses, when protected by substantial bumpers meet this requirement. Fuel containers on passenger-carrying vehicles must be installed as far from the engine as is practical, and the passenger space and any space containing radio equipment must be sealed from the container space to prevent direct seepage of gas to these spaces. The container compartment must be vented to the outside. In case the fuel container is mounted near the engine or the exhaust system, the container must be shielded against direct heat radiation.
- (2) Containers must be installed with as much clearance as practical and at least the minimum road clearance of the vehicle under maximum spring deflection. This minimum clearance must be to the bottom of the container or to the lowest fitting on the container or housing, whichever is lower.
- (3) Permanent and removable fuel containers must be securely mounted to prevent jarring loose, slipping, or rotating, and the fastenings must be designed and constructed to withstand static loading in any direction equal to twice the weight of the tank and attachments when filled with fuel using a safety factor of at least four based on the ultimate strength of the material to be used. Field welding, when necessary, must be made only on saddle plates, lugs or brackets, attached to the container by the manufacturer.
- (4) Fuel containers on buses must be permanently installed.
- (5) Containers from which only vapor is to be withdrawn must be installed and equipped with suitable connections to minimize the accidental withdrawal of liquid.

[Recodified as § 296-307-42507. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-42507, filed 10/31/96, effective 12/1/96.]

WAC 296-307-42509 What requirements apply to valves and accessories?

- (1) Container valves and accessories must have a rated working pressure of at least 250 psig, and must be suitable for LP-gas service.
- (2) The filling connection must be fitted with an approved double back-pressure check valve, or a positive shut off in conjunction with an internal back-pressure check valve. On a removable container the filler valve may be a hand operated shut-off valve with an internal excess flow valve. Main shut-off valves on the container on liquid and vapor must be readily accessible.
- (3) Filling connections equipped with approved automatic back-pressure check valves, and safety-relief valves, all connections to the containers having openings for the flow of gas in excess of a No. 54 drill size must have approved automatic excess flow valves to prevent discharge of content in case connections are broken.

WAC 296-307-42509 (Cont.)

- (4) Liquid-level gauging devices must meet the following requirements:
- (a) Variable liquid-level gauges that require the venting of fuel to the atmosphere are prohibited on fuel containers of industrial trucks (including lift trucks).
 - (b) On portable containers that may be filled in the vertical and/or horizontal position, the fixed liquid-level gauge must indicate maximum permitted filling level for both vertical and horizontal filling with the container oriented to place the safety-relief valve in communication with the vapor space.
 - (c) For containers used solely in farm tractor service and charged at a point at least 50 feet from any important building, the fixed liquid-level gauging device may be constructed so that the outward flow of container content exceeds that passed by a No. 54 drill size opening, but must never exceed that passed by a No. 31 drill-size opening. An excess flow valve is not required. Fittings equipped with restricted drill size opening and the container on which they are used must be marked to indicate the size of the opening.
 - (d) All valves and connections on containers must be adequately protected to prevent damage due to accidental contact with stationary objects or from loose objects thrown up from the road. All valves must be safeguarded against damage due to collision, overturning or other accident. Farm tractors where parts of the vehicle provide protection to valves and fittings meet this requirement. However, on removable type containers the protection for the fittings must be permanently attached to the container.
 - (e) You should normally exchange removable fuel outdoors. When removable fuel containers are used, means shall be provided in the fuel system to minimize the escape of fuel when the containers are exchanged. You must use one of the following methods:
 - (i) Using an approved automatic quick-closing coupling (a type closing in both directions when uncoupled) in the fuel line; or
 - (ii) Closing the valve at the fuel container and allowing the engine to run until the fuel in the line is consumed.

[Recodified as § 296-307-42509. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-42509, filed 10/31/96, effective 12/1/96.]

WAC 296-307-42511 What requirements apply to piping, tubing, and fittings?

- (1) Pipe from fuel container to first-stage regulator must be at least schedule 80 wrought iron or steel (black or galvanized), brass or copper; or seamless copper, brass, or steel tubing. Steel tubing must have a minimum wall thickness of 0.049 inch. Steel pipe or tubing must be adequately protected against exterior corrosion. Copper tubing must be types K or L or equivalent with a minimum wall thickness of 0.032 inch. Approved flexible connections may be used between container and regulator or between regulator and gas-air mixer. Using aluminum pipe or tubing is prohibited. For removable containers, an approved flexible connection must be used between the container and the fuel line.

- (2) All piping must be installed, braced, and supported to minimize vibration strains or wear.

[Recodified as § 296-307-42511. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-42511, filed 10/31/96, effective 12/1/96.]

WAC 296-307-42513 What requirements apply to safety devices?

- (1) Spring-loaded internal safety-relief valves must be used on all motor fuel containers.

WAC 296-307-42513 (Cont.)

- (2) The discharge outlet from safety-relief valves must be located on the outside of enclosed spaces and as far as practical from possible sources of ignition, and vented upward within 45 degrees of the vertical to prevent impingement of escaping gas upon containers, or parts of vehicles, or on vehicles in adjacent lines of traffic. A rain cap or other protector must be used to keep water and dirt from collecting in the valve.
- (3) When a discharge line from the container safety-relief valve is used, the line shall be metallic, other than aluminum, and must be sized, located, and maintained so as not to restrict the required flow of gas from the safety-relief valve. The discharge line must be able to withstand the pressure resulting from the discharge of vapor when the safety-relief valve is in the full open position. Flexible metal hose or tubing must be used when necessary.
- (4) Portable containers equipped for volumetric filling may be filled in either the vertical or horizontal position only when oriented to place the safety-relief valve in communication with the vapor space.

[Recodified as § 296-307-42513. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-42513, filed 10/31/96, effective 12/1/96.]

WAC 296-307-42515 What requirements apply to vaporizers?

- (1) Vaporizers, their parts, and other devices that may be subjected to container pressure must have a design pressure of at least 250 psig.
- (2) Each vaporizer must have a valve or suitable plug that will permit substantially complete draining of the vaporizer. It must be located at or near the lowest portion of the section occupied by the water or other heating medium.
- (3) Vaporizers must be securely fastened to minimize the possibility of loosening.
- (4) Each vaporizer must be permanently marked at a visible point as follows:
 - (a) With the design pressure of the fuel-containing portion in psig.
 - (b) With the water capacity of the fuel-containing portion of the vaporizer in pounds.
- (5) Devices to supply heat directly to a fuel container must have an automatic device to cut off the supply of heat before the pressure inside the fuel container reaches 80% of the start-to-discharge pressure setting of the safety-relief device on the fuel container.
- (6) Engine exhaust gases may be used as a direct source of heat supply for the vaporization of fuel if the materials of construction of those parts of the vaporizer in contact with exhaust gases are resistant to the corrosive action of exhaust gases and the vaporizer system is designed to prevent excessive pressures.
- (7) Fusible plugs are prohibited on vaporizers.

[Recodified as § 296-307-42515. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-42515, filed 10/31/96, effective 12/1/96.]

WAC 296-307-42517 What requirements apply to gas regulating and mixing equipment?

- (1) Approved automatic pressure reducing equipment must be installed securely between the fuel supply container and gas-air mixer to reduce the pressure of the fuel delivered to the gas-air mixer.

WAC 296-307-42517 (Cont.)

- (2) An approved automatic shut-off valve must be provided in the fuel system at some point ahead of the inlet of the gas-air mixer, designed to prevent flow of fuel to the mixer when the ignition is off and the engine is not running. For industrial trucks and engines operating in buildings other than those used exclusively to house engines, the automatic shut-off valve must be designed to operate if the engine stops. Atmospheric regulators (zero governors) are adequate as an automatic shut-off valve only in cases of outdoor operation such as farm tractors, construction equipment, irrigation pump engines, and other outdoor stationary engine installations.
- (3) The source of air for combustion must be completely isolated from the passenger compartment, ventilating system, or air-conditioning system.

[Recodified as § 296-307-42517. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-42517, filed 10/31/96, effective 12/1/96.]

WAC 296-307-42519 What is the maximum container capacity allowed? A single fuel container used on passenger carrying vehicles must have a maximum of 200 gallons water capacity. A single fuel container on other vehicles normally operating on the highway must have a maximum of 300 gallons water capacity except as provided in WAC 296-307-42503(1).

[Statutory Authority: Chapter 49.17.040 RCW. 98-24-096 (Order 98-13) § 296-307-42519, filed 12/01/98, effective 03/01/99. [Recodified as § 296-307-42519. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-42519, filed 10/31/96, effective 12/1/96.]

WAC 296-307-42521 What requirements apply to stationary engines used indoors? Stationary engines and gas turbines installed in buildings, including portable engines used instead of or to supplement stationary engines, must comply with the Standard for the Institution and Use of Stationary Combustion Engines and Gas Turbines, NFPA 37-1970, and the appropriate requirements of WAC 296-307-410 through 296-307-420.

[Statutory Authority: Chapter 49.17.040 RCW. 98-24-096 (Order 98-13) § 296-307-42521, filed 12/01/98, effective 03/01/99. [Recodified as § 296-307-42521. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-42521, filed 10/31/96, effective 12/1/96.]

WAC 296-307-42523 What requirements apply to portable engines used indoors?

- (1) Portable engines may be used in buildings only for emergency use, and according to WAC 296-307-42521.
- (2) Exhaust gases must be discharged outside the building or to an area where they will not constitute a hazard.
- (3) Provision must be made to supply sufficient air for combustion and cooling.
- (4) An approved automatic shut-off valve must be provided in the fuel system ahead of the engine, designed to prevent flow of fuel to the engine when the ignition is off or if the engine should stop.

[Statutory Authority: Chapter 49.17.040 RCW. 98-24-096 (Order 98-13) § 296-307-42523, filed 12/01/98, effective 03/01/99. [Recodified as § 296-307-42523. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-42523, filed 10/31/96, effective 12/1/96.]

WAC 296-307-42525 What requirements apply to industrial trucks used indoors?

- (1) LP-gas-fueled industrial trucks may be used in buildings and structures.
- (2) No more than two LP-gas containers must be used on an industrial truck for motor fuel purposes.
- (3) LP-gas-fueled industrial trucks may be used in buildings frequented by the public, when occupied by the public. The total water capacity of containers on each industrial truck must be a maximum of 105 pounds (nominal 45 pounds LP-gas).
- (4) Trucks must be attended at all times in areas occupied by the public.

WAC 296-307-42525 (Cont.)

- (5) Industrial trucks must not be parked and left unattended in areas of possible excessive heat or sources of ignition.

[Recodified as § 296-307-42525. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-42525, filed 10/31/96, effective 12/1/96.]

WAC 296-307-42527 How must LP-gas-fueled vehicles be garaged?

- (1) LP-gas-fueled vehicles may be stored or serviced inside garages if there are no leaks in the fuel system and the fuel tanks are not filled beyond the maximum filling capacity allowed.
- (2) LP-gas-fueled vehicles being repaired in garages must have the container shut-off valve closed except when fuel is required for engine operation.
- (3) Such vehicles must not be parked near sources of heat, open flames, or similar sources of ignition or near open pits unless such pits are adequately ventilated.

[Recodified as § 296-307-42527. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-42527, filed 10/31/96, effective 12/1/96.]

WAC 296-307-430 Storage of containers awaiting use or resale.

[Recodified as § 296-307-430. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-430, filed 10/31/96, effective 12/1/96.]

WAC 296-307-43001 What does this section cover? WAC 296-307-430 applies to the storage of portable containers a maximum of 1,000 pounds water capacity, filled or partially filled, at user location but not connected for use, or in storage for resale by dealers or resellers. This section does not apply to containers stored at charging plants or at plants devoted primarily to the storage and distribution of LP-gas or other petroleum products.

[Statutory Authority: Chapter 49.17.040 RCW. 98-24-096 (Order 98-13) § 296-307-43001, filed 12/01/98, effective 03/01/99. [Recodified as § 296-307-43001. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-43001, filed 10/31/96, effective 12/1/96.]

WAC 296-307-43003 What general requirements apply to storage of containers?

- (1) Containers in storage must be located to minimize exposure to excessive temperature rise, physical damage, or tampering.
- (2) Containers stored inside must be located away from exits, stairways, or in areas normally used or intended for the safe exit of people.
- (3) Container valves must be protected while in storage as follows:
- (a) By setting into recess of container to prevent the possibility of their being struck if the container is dropped upon a flat surface; or
 - (b) By ventilated cap or collar, fastened to container capable of withstanding blow from any direction equivalent to that of a thirty-pound weight dropped four feet. Construction must be such that a blow will not be transmitted to a valve or other connection.
- (4) The outlet valves of containers in storage must be closed.
- (5) Empty containers that have been in LP-gas service should preferably be stored in the open. When stored inside, they must be considered full containers for the purpose of determining the maximum quantity of LP-gas permitted by this section.

[Recodified as § 296-307-43003. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-43003, filed 10/31/96, effective 12/1/96.]

WAC 296-307-43005 How must containers be stored within buildings frequented by the public?

DOT containers with a maximum individual water capacity of 2-1/2 pounds, used with completely self-contained hand torches and similar applications, may be stored or displayed in a building frequented by the public. The display of such containers must be limited to a total of 24 units of each brand and size. The total quantity on display and in storage must not exceed 200 pounds LP-gas.

[Recodified as § 296-307-43005. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-43005, filed 10/31/96, effective 12/1/96.]

WAC 296-307-43007 How must containers be stored in buildings not frequented by the public?

- (1) The quantity of LP-gas stored must be a maximum of 300 pounds (approximately 2,550 cubic feet in vapor form), except when stored within special buildings or rooms.
- (2) Containers carried as a part of service equipment on highway mobile vehicles are not considered in the total storage capacity if the vehicles are stored in private garages, and are limited to one container per vehicle with a maximum LP-gas capacity of 100 pounds. All container valves must be closed.

[Recodified as § 296-307-43007. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-43007, filed 10/31/96, effective 12/1/96.]

WAC 296-307-43009 How must containers be stored within special buildings or rooms?

- (1) The quantity of LP-gas stored in special buildings or rooms must be a maximum of 10,000 pounds.
- (2) The walls, floors, and ceilings of container storage rooms that are within or adjacent to other parts of the building must be constructed of material having at least a two-hour fire resistance rating.
- (3) At least 10% of the exterior walls or roof must be of explosion relieving construction.
- (4) Each opening from storage rooms to other parts of the building must be protected by a listed one and one-half hour "(B)" fire door.
- (5) Such rooms must have no open flames for heating or lighting.
- (6) Such rooms must be adequately ventilated both top and bottom to the outside only. The openings from such vents must be at least five feet away from any other opening into any building.
- (7) The floors of such rooms must not be below ground level. Any space below the floor must be of solid fill or properly ventilated to the open air.
- (8) Such storage rooms must not be located adjoining the line of property occupied by schools, churches, hospitals, athletic fields or other points of public gathering.

[Recodified as § 296-307-43009. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-43009, filed 10/31/96, effective 12/1/96.]

WAC 296-307-43011 How must containers be stored outdoors?

- (1) Storage outside of buildings, for containers awaiting use or resale, must be located according to the table below with respect to:
 - (a) The nearest important building or group of buildings;
 - (b) The line of adjoining property that may be built on;
 - (c) Busy thoroughfares;
 - (d) The line of adjoining property occupied by schools, churches, hospitals, athletic fields, or other points of public gathering.

WAC 296-307-43011 (Cont.)

Quantity of LP-Gas Stored	Distance
500 pounds or less	0
501 to 2,500 pounds	0*
2,501 to 6,000 pounds	10 feet
6,001 to 10,000 pounds	20 feet
Over 10,000 pounds	25 feet
*Containers must be at least ten feet away from any building on adjoining property, any sidewalk, or any of the exposures described in (c) or (d) of this subsection.	

(2) Containers must be in a suitable enclosure or otherwise protected against tampering.

[Recodified as § 296-307-43011. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-43011, filed 10/31/96, effective 12/1/96.]

WAC 296-307-43013 What fire protection must be provided for stored containers? Storage locations other than supply depots separated and located apart from dealer, reseller, or user establishments must have at least one approved portable fire extinguisher having a minimum rating of 8-B, C.

[Recodified as § 296-307-43013. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-43013, filed 10/31/96, effective 12/1/96.]

WAC 296-307-435 LP-gas system installations on commercial vehicles.

[Recodified as § 296-307-435. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-435, filed 10/31/96, effective 12/1/96.]

WAC 296-307-43501 What does this section cover?

(1) WAC 296-307-435 applies to:

- (a) LP-gas system installations on vehicles (self-propelled, trailers, or semitrailers) used for commercial or construction purposes;
- (b) All exchangeable container systems with container capacities greater than 105 pounds water capacity (approximately 45 pounds LP-gas capacity); and
- (c) Systems using containers permanently mounted on vehicles.

(2) All LP-gas installations on commercial vehicles must meet all requirements of WAC 296-307-410 (unless otherwise indicated) and the additional requirements of this section. When such a vehicle is permanently parked, and LP-gas is supplied from a system not mounted on and secured to the unit, WAC 296-307-415 and 296-307-420 also apply.

(3) This section does not apply to LP-gas motor fuel systems covered by WAC 296-307-425.

[Statutory Authority: Chapter 49.17.040 RCW. 98-24-096 (Order 98-13) § 296-307-43501, filed 12/01/98, effective 03/01/99. [Recodified as § 296-307-43501. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-43501, filed 10/31/96, effective 12/1/96.]

WAC 296-307-43503 How must containers be constructed? Containers must be constructed according to WAC 296-307-41011, and marked according to the applicable requirements of WAC 296-307-41015, and must also meet the following:

(1) Containers designed for use as portable cylinders must be constructed according to DOT specifications.

WAC 296-307-43503 (Cont.)

- (2) All other containers whether designed for permanent mounting, or for portable or semiportable use (such as skid tanks), must be constructed as provided for by WAC 296-307-41009(4) and 296-307-41011(1).
- (3) Nonrecessed container fittings and accessories must be protected against damage by either:
 - (a) Their location;
 - (b) The vehicle frame or bumper; or
 - (c) Protective housing. The housing must meet the requirements under which the tanks are fabricated with respect to design and construction and must be designed to withstand static loading in any direction equal to twice the weight of the tank and attachments when filled with the lading at a safety factor of at least four, based on the ultimate strength of the material used. The housing must have a weather cover if necessary to ensure proper operation of valves and safety devices.
- (4) Manually operated shut-off valves or self-closing internal valves must be closed except during transfer operations.
- (5) Permanently installed containers must meet the following requirements:
 - (a) Tank motor vehicles with frames not made integral with the tank, as by welding, must have turnbuckles or similar positive devices for drawing the tank down tight on the frame. In addition, suitable stops or anchors must be attached to the frame and/or the tank to prevent relative motion between them from starting, stopping, and turning. The stops and anchors must be installed to be accessible for inspection and maintenance.
 - (b) Any tank motor vehicle designed and constructed so that the cargo tank constitutes the stress member used instead of a frame must be supported by external cradles enclosing at least 120 degrees of the shell circumference. The design calculations must include beam stress, shear stress, torsion stress, bending moment, and acceleration stress for the cargo tank as a whole using a factor of safety of four, based on the ultimate tensile strength of the material. Maximum concentrated stresses that might be created at pads and cradles due to shear, bending, and torsion shall also be calculated according to Appendix G of the American Society of Mechanical Engineers, Unfired Pressure Vessel Code, 1968. Fully loaded vehicles must be assumed to be operating under highway conditions equal to two "g" loading. The effects of fatigue shall be taken into consideration. Cargo tanks mounted on frames may be supported by upright supports attached to pads if these factors are taken into account.
 - (c) Where any tank support is attached to any part of a tank head, the stresses imposed upon the head must be provided for as required above.
 - (d) Tank supports, stops, anchors, and bumpers must not be welded directly to the tank but must be attached by means of pads of the same material as the tank. The pad thickness must be at least 1/4 inch, or the thickness of the shell material if less, and no greater than the shell material. Each pad must extend at least four times its thickness, in each direction, beyond the weld attaching the support, bumper, stop, or anchor. Each pad must be preformed to an inside radius no greater than the outside radius of the tank at the place of attachment. Each pad corner must be rounded to a radius at least one-fourth the width of the pad, and no greater than one-half the width of the pad. Weepholes and tell-tale holes, if used, must be drilled or punched before the pads are attached to the tank. Each pad must be attached to the tank by continuous fillet welding using filler material having properties that meet the recommendations of the maker of the shell and head material.

WAC 296-307-43503 (Cont.)

- (6) Portable or semiportable containers must meet the applicable requirements of WAC 296-307-42507(3). Containers designed for permanent installation as part of systems under WAC 296-307-420 are prohibited.

- (a) Filling connections must have an approved automatic back pressure check valve, excess flow check valve, or quick closing internal valve to prevent excessive escape of gas in case the filling connection is broken.

Exception: Where the filling and discharge connect on a common opening in the container shell, and the opening is fitted with a quick-closing internal valve, the automatic valve is not required.

Every inlet and outlet connection must have a manually or automatically operated shut-off valve. Liquid discharge openings, except those for engine fuel lines, on tanks built after September 1, 1965, must be fitted with a remotely controlled internal shut-off valve. Valves must meet the following requirements:

- (i) The seat of the valve must be inside the tank, or in the opening nozzle or flange, or in a companion flange bolted to the nozzle or flange.
 - (ii) All parts of the valve inside the tank, nozzle, or companion flange must be made of material that protects against corrosion or other deterioration in the presence of the lading.
 - (iii) The parts must be arranged so that damage to parts exterior to the tank will not prevent effective seating of the valve.
 - (iv) The valve may be operated mechanically, by hydraulically, or by air, or gas pressure.
 - (v) The valve must have remote means of automatic closure, both mechanical and thermal, in at least two places for tanks over 3,500 gallons water capacity. These remote control stations must be located at each end of the tank and diagonally opposite. The thermal control mechanism must have a fusible element with a melting point between 220°F and 208°F. At least one remote control station must be provided for tanks of 3,500 gallons water capacity or less, and such actuating means may be mechanical.
- (b) All other connections to containers, except those used for gauging devices, thermometer wells, safety-relief devices, and plugged openings, must have suitable automatic excess flow valves, or may instead be fitted with quick-closing internal valves.

The control mechanism for the internal valve must have a secondary control, remote from the fill or discharge connections (for use in the event of accidents or fire during delivery operations), and such control mechanism must have a fusible element with a melting point not over 220°F or less than 208°F.

- (c) Excess flow valves must close automatically at the rated flow of vapor or liquid as specified by the valve manufacturers. The flow rating of the piping beyond the excess flow valve must be greater than that of the excess flow valve and such rating must include valves, fittings, and hose.

Exception: When branching or necessary restrictions are incorporated in a piping system so that flow ratings are less than that of the excess flow valve and the tank, then additional excess flow valves must be installed in the piping where such flow rate is reduced.

WAC 296-307-43503 (Cont.)

- (d) Container inlets and outlets, except those used for safety-relief valves, liquid-level gauging devices, and pressure gauges, must be labeled to designate whether they communicate with vapor or liquid space when the container is filled to maximum permitted filling density. Labels may be on the valves.

[Statutory Authority: Chapter 49.17.040 RCW. 98-24-096 (Order 98-13) § 296-307-43503, filed 12/01/98, effective 03/01/99.
[Recodified as § 296-307-43503. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-43503, filed 10/31/96, effective 12/1/96.]

WAC 296-307-43505 What is the maximum capacity allowed for LP-gas installations on commercial vehicles? A single fuel container used on passenger carrying vehicles must not exceed 200 gallons water capacity.

[Recodified as § 296-307-43505. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-43505, filed 10/31/96, effective 12/1/96.]

WAC 296-307-43507 Where must systems be located?

- (1) Containers must not be installed, transported, or stored (even temporarily) inside any vehicle covered by these standards except as provided by the DOT regulations.
- (2) Containers, control valves, and regulating equipment comprising a complete system must be suitably protected against damage and weather. Systems may be installed in a recess vaportight to the inside of the vehicle and accessible from and vented to the outside.
- (3) Systems installed outside of mobile units must be located so that discharge from safety-relief devices must be at least 3 feet horizontally away from any opening into the unit below the level of such discharge. When the system is located in a recess vaportight to the inside, vent openings in the recess must be at least 3 feet horizontally away from any opening into the mobile unit below the level of these vents.
- (4) There must be no fuel connection between tractor and trailer or other vehicle units.
- (5) The container or container carrier must be secured in place by fastenings designed and constructed with a minimum safety factor of four to withstand loading in any direction equal to twice the weight of the container when filled to normal capacity with LP-gas.

[Recodified as § 296-307-43507. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-43507, filed 10/31/96, effective 12/1/96.]

WAC 296-307-43509 What requirements apply to valves and accessories? Container valves and accessories must be provided, protected and mounted as follows:

- (1) Systems using DOT cylinders according to WAC 296-307-41511.
- (2) All other systems according to WAC 296-307-42005 (2) through (8).
- (3) Portable, semiportable and permanently mounted containers shall be mounted and protected as provided under WAC 296-307-43503 (2), (5), and (6).

[Statutory Authority: Chapter 49.17.040 RCW. 98-24-096 (Order 98-13) § 296-307-43509, filed 12/01/98, effective 03/01/99.
[Recodified as § 296-307-43509. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-43509, filed 10/31/96, effective 12/1/96.]

WAC 296-307-43511 What requirements apply to safety devices?

- (1) DOT containers must have safety-relief devices as required by DOT regulations.
- (2) A final stage regulator of an LP-gas system (excluding any appliance regulator) must have, on the low-pressure side, a relief valve that is set to start to discharge within the limits specified in Table U-7.

WAC 296-307-43511 (Cont.)

- (3) The relief valve and space above the regulator and relief valve diaphragms must be vented to the outside air and terminate at a position to minimize the possibility of vapors accumulating at sources of ignition.
- (4) Whenever equipment such as a cargo heater or cooler on commercial vehicles is designed to be in operation while in transit, suitable means to stop the flow such as an excess flow valve or other device, must be installed. This device will be actuated to stop the flow in the event of the break in the fuel supply line. All excess flow valves must comply with WAC 296-307-41019(3).

[Statutory Authority: Chapter 49.17.040 RCW. 98-24-096 (Order 98-13) § 296-307-43511, filed 12/01/98, effective 03/01/99.
[Recodified as § 296-307-43511. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-43511, filed 10/31/96, effective 12/1/96.]

WAC 296-307-43513 What types of systems may be used on commercial vehicles? Commercial vehicles must use either vapor withdrawal or liquid withdrawal systems.

[Recodified as § 296-307-43513. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-43513, filed 10/31/96, effective 12/1/96.]

WAC 296-307-43515 What requirements apply to enclosures and mounting?

- (1) Housing or enclosures must be designed to provide proper ventilation.
- (2) Hoods, dome, or removable portions of cabinets must have means to keep them firmly in place during transit.
- (3) The assembly must hold the containers firmly in position and prevent their movement during transit according to WAC 296-307-42507(3).
- (4) Containers must be mounted on a substantial support or base secured firmly to the vehicle chassis. Neither the container nor its support must extend below the frame.

[Statutory Authority: Chapter 49.17.040 RCW. 98-24-096 (Order 98-13) § 296-307-43515, filed 12/01/98, effective 03/01/99.
[Recodified as § 296-307-43515. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-43515, filed 10/31/96, effective 12/1/96.]

WAC 296-307-43517 What requirements apply to piping, tubing, and fittings?

- (1) Regulators must be connected directly to the container valve outlet or mounted securely by means of support bracket and connected to the container valve or valves with a listed high pressure flexible connector.
- (2) Provision must be made between the regulator outlet and the gas service lines by either a flexible connector or a tubing loop to provide for expansion, contraction, jarring, and vibration.
- (3) Aluminum alloy piping is prohibited. Steel tubing must have a minimum wall thickness of 0.049 inch. Steel piping or tubing must be adequately protected against exterior corrosion.
- (4) Approved gas tubing fittings must be used for tubing connections.
- (5) The fuel line must be firmly fastened in a protected location and where under the vehicle and outside and below any insulation or false bottom, fastenings must prevent abrasion or damage to the gas line due to vibration. Where the fuel line passes through structural members or floors, a rubber grommet or equivalent must be installed to prevent chafing.
- (6) The fuel line must be installed to enter the vehicle through the floor directly beneath or adjacent to the appliance that it serves. When a branch line is required, the tee connection must be in the main fuel line and located under the floor and outside the vehicle.

WAC 296-307-43517 (Cont.)

- (7) All parts of the system assembly must be designed and secured to preclude such parts working loose during transit.

[Recodified as § 296-307-43517. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-43517, filed 10/31/96, effective 12/1/96.]

WAC 296-307-43519 What requirements apply to appliances?

- (1) LP-gas appliances must be approved for use on commercial vehicles.
- (2) In vehicles not intended for human occupancy, where the gas-fired heating appliance is used to protect the cargo, such heater may be unvented, but provision must be made to dispose of the products of combustion to the outside.
- (3) In vehicles intended for human occupancy, all gas-fired heating appliances, including water heaters, must be designed or installed to provide for complete separation of the combustion system from the atmosphere of the living space. Such appliances must be installed with the combustion air inlet assembly furnished as a component of the appliance, and with either:
- (a) The flue gas outlet assembly furnished as a component of the appliance; or
- (b) A listed roof jack if the appliance is listed for such use.

The combustion air inlet assembly, flue gas outlet assembly, and roof jack must extend to the outside atmosphere.

- (4) Provision must be made to ensure an adequate supply of outside air for combustion.
- (5) All gas-fired heating appliances and water heaters must have an approved automatic device designed to shut off the flow of gas to the main burner and to the pilot in the event the pilot flame is extinguished.
- (6) Gas-fired appliances installed in the cargo space must be readily accessible.
- (7) Appliances must be constructed or protected to minimize the possible damage or impaired operation resulting from cargo shifting or handling.

- (8) Appliances inside the vehicle must be located so that a fire at an appliance will not block the exit route.
- [Recodified as § 296-307-43519. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-43519, filed 10/31/96, effective 12/1/96.]

WAC 296-307-43521 What general precautions must be followed for LP-gas system installations on commercial vehicles?

- (1) DOT containers must be marked, maintained, and requalified for use according to DOT regulations.
- (2) Containers that have not been requalified according to DOT regulations must be removed from service. Requalified containers must be stamped with the date of requalification. When DOT cylinders are requalified by retesting, the retest must be made according to DOT regulations.
- (3) Containers must not be charged with fuel unless they bear the proper markings of the code under which they were constructed, and with their water capacity. In the case of cylinders or portable containers filled by weight, the container must be marked with its tareweight.

WAC 296-307-43521 (Cont.)

- (4) DOT containers that have been involved in a fire must not be recharged until they have been requalified for service according to DOT regulations.
- (5) API-ASME containers or ASME containers that have been involved in a fire must not be recharged until they have been retested according to the requirements for their original hydrostatic test and found to be suitable for continued service.

“API-ASME (ASME) container” means a container constructed according to the Rules for Construction of Unfired Pressure Vessels, section VIII, Division 1, American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, 1968 edition.

- (6) Containers must not be charged without the consent of the owner.
- (7) A permanent caution plate must be provided on the appliance or adjacent to the container outside of any enclosure. It must include the word “caution” and the following or similar instructions.
 - (a) Be sure all appliance valves are closed before opening container valve.
 - (b) Connections at appliances, regulators, and containers must be checked periodically for leaks with soapy water or its equivalent.
 - (c) A match or flame must not be used to check for leaks.
 - (d) Container valves must be closed except when the equipment is in use.

[Recodified as § 296-307-43521. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-43521, filed 10/31/96, effective 12/1/96.]

WAC 296-307-43523 How must containers be charged? Containers must be charged according to DOT specifications.

[Recodified as § 296-307-43523. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-43523, filed 10/31/96, effective 12/1/96.]

WAC 296-307-43525 What fire protection must be provided for mobile cook units? Mobile cook units must have at least one approved portable fire extinguisher having a minimum rating of 8-B, C.

[Recodified as § 296-307-43525. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-43525, filed 10/31/96, effective 12/1/96.]

WAC 296-307-440 LP-gas service stations.

[Recodified as § 296-307-440. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-440, filed 10/31/96, effective 12/1/96.]

WAC 296-307-44001 What does this section cover? WAC 296-307-440 applies to storage containers, dispensing devices, and pertinent equipment in service stations where LP-gas is stored and dispensed into fuel tanks of motor vehicles. LP-gas service stations must meet all requirements of WAC 296-307-410 and the requirements of this section.

[Statutory Authority: Chapter 49.17.040 RCW. 98-24-096 (Order 98-13) § 296-307-44001, filed 12/01/98, effective 03/01/99. [Recodified as § 296-307-44001. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-44001, filed 10/31/96, effective 12/1/96.]

WAC 296-307-44003 How must storage containers be designed and classified? Storage containers must be designed and classified according to the following table:

WAC 296-307-44003 (Cont.)

Minimum design pressures of container lb. per sp. in. gauge			
Container Type	For gases with vapor pressure not to exceed 1b. per sp. in. gauge 100°F (37.8°C.)	1949 and earlier editions of ASME Code (Par. U-68, U-69)	1949 edition of ASME Code (Par. U-200, U-201); 1950, 1952, 1956, 1959, 1962, 1965, and 1968 (Division 1) editions of ASME Code; All editions of API-ASME Code ²
200 ¹	215	200	250
¹ Container type may be increased by increments of 25. The minimum design pressure of containers shall be 100% of the container type designations when constructed under 1949 or earlier editions of the ASME Code (Par. U-68 and U-69). The minimum design pressure of containers shall be 125% of the container type designation when constructed under: 1. The 1949 ASME Code (Par. U-200 and U-201); 2. 1950, 1952, 1956, 1959, 1962, 1965, and 1968 (Division 1) editions of ASME Code; and 3. All editions of the API-ASME Code. ² Construction of containers under the API-ASME Code is prohibited after July 1, 1961.			

[Recodified as § 296-307-44003. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-44003, filed 10/31/96, effective 12/1/96.]

WAC 296-307-44005 What requirements apply to valves and accessories?

(1) A filling connection on the container must be fitted with one of the following:

- (a) A combination back-pressure check and excess flow valve.
- (b) One double or two single back-pressure valves.
- (c) A positive shut-off valve, in conjunction with either:
 - (i) An internal back-pressure valve; or
 - (ii) An internal excess flow valve.

Instead of an excess flow valve, filling connections may be fitted with a quick-closing internal valve that only opens during operating periods. The mechanism for such valves may have a secondary control that will close automatically in case of fire. The melting point for a fusible plug must be a maximum of 220°F.

(2) A filling pipe inlet terminal off the container must have a positive shut-off valve and either:

- (a) A back pressure check valve; or

WAC 296-307-44005 (Cont.)

- (b) An excess flow check valve.
- (3) All openings in the container must have approved excess flow check valves.

Exceptions:

- (a) Filling connections;
 - (b) Safety-relief connections;
 - (c) Liquid-level gauging devices; and
 - (d) Pressure gauge connections.
- (4) All container inlets and outlets must be labeled to designate whether they connect with vapor or liquid (labels may be on valves).

Exceptions:

- (a) Safety-relief valves;
 - (b) Liquid-level gauging devices; and
 - (c) Pressure gauges.
- (5) Each storage container must have a suitable pressure gauge.
- [Recodified as § 296-307-44005. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-44005, filed 10/31/96, effective 12/1/96.]

WAC 296-307-44007 What requirements apply to safety devices?

- (1) All safety-relief devices must be installed as follows:
 - (a) On the container and directly connected with the vapor space.
 - (b) Safety-relief valves and discharge piping shall be protected against physical damage. The outlet must have loose-fitting rain caps. There shall be no return bends or restrictions in the discharge piping.
 - (c) The discharge from two or more safety-relief valves with the same pressure settings may be run into a common discharge header. The cross-sectional area of such header must be at least equal to the sum of the individual discharges.
 - (d) Discharge from a safety-relief device that terminates in or beneath any building is prohibited.
- (2) Aboveground containers must have safety-relief valves as follows:
 - (a) The rate of discharge, which may be provided by one or more valves, must be at least that specified in WAC 296-307-41025(2).

WAC 296-307-44007 (Cont.)

- (b) The discharge from safety-relief valves must be vented upward to the open air to prevent impingement of escaping gas upon the container. You must use loose-fitting rain caps. On a container having a water capacity greater than 2,000 gallons, the discharge from the safety-relief valves must be vented upward away from the container to a point at least 7 feet above the container. Provisions must be made so that any liquid or condensate accumulation inside the relief valve or its discharge pipe will not render the valve inoperative. If a drain is used, you must protect the container, adjacent containers, piping, or equipment against impingement of flame resulting from ignition of the product escaping from the drain.
- (3) Underground containers must have safety-relief valves as follows:
 - (a) The discharge from safety-relief valves must be piped upward to a point at least 10 feet above the ground. The discharge lines or pipes must be adequately supported and protected against physical damage.
 - (b) In areas where the manhole or housing may flood, the discharge from regulator vent lines should be above the highest probable water level.
 - (c) If no liquid is put into a container until after it is buried and covered, the rate of discharge of the relief valves may be reduced to at least 30 percent of the rate shown in WAC 296-307-41025(2). If liquid fuel is present during installation of containers, the rate of discharge must be the same as for aboveground containers. Only empty containers may be uncovered.

[Statutory Authority: Chapter 49.17.040 RCW. 98-24-096 (Order 98-13) § 296-307-44007, filed 12/01/98, effective 03/01/99.
[Recodified as § 296-307-44007. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-44007, filed 10/31/96, effective 12/1/96.]

WAC 296-307-44009 What is the maximum capacity allowed for containers? Individual storage containers must be a maximum of 30,000 gallons water capacity.

[Recodified as § 296-307-44009. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-44009, filed 10/31/96, effective 12/1/96.]

WAC 296-307-44011 How must storage containers be installed?

- (1) Each storage container used exclusively in service station operation must comply with the following table. This table outlines the minimum distances from a container to a building, group of buildings, or adjoining property lines that may be built on.

Minimum Distances		
Water capacity per container (gallons)	Aboveground and Underground (feet)	Between aboveground containers (feet)
Up to 2,000	25	3
Over 2,000	50	5
<i>Note: The above distances may be reduced to at least 10 feet for service station buildings of other than wood frame construction.</i>		

- (a) Readily ignitable material including weeds and long dry grass, must be removed within 10 feet of containers.
- (b) The minimum separation between LP-gas containers and flammable liquid tanks must be 20 feet and the minimum separation between a container and the centerline of the dike must be 10 feet.
- (c) LP-gas containers located near flammable liquid containers must be protected against the flow or accumulation of flammable liquids by diking, diversion curbs, or grading.

WAC 296-307-44011 (Cont.)

- (d) LP-gas containers located within diked areas for flammable liquid containers are prohibited.
 - (e) Field welding is permitted only on saddle plates or brackets that were applied by the container manufacturer.
 - (f) When permanently installed containers are interconnected, you must allow for expansion, contraction, vibration, and settling of containers and interconnecting piping. Where flexible connections are used, they must be approved and designed for a bursting pressure of at least five times the vapor pressure of the product at 100°F. Using nonmetallic hose is prohibited for interconnecting containers.
 - (g) Where high water table or flood conditions may be encountered, you must protect against container flotation.
- (2) Aboveground containers must be installed according to this section.
- (a) Containers may be installed horizontally or vertically.
 - (b) Containers must be protected by crash rails or guards to prevent physical damage unless they are protected by location. Servicing vehicles within 10 feet of containers is prohibited.
 - (c) Container foundations must be of substantial masonry or other noncombustible material. Containers must be mounted on saddles that permit expansion and contraction, and must provide against excess stresses. Corrosion protection must be provided for tank-mounting areas. Structural metal container supports must be protected against fire.
- Exception: This protection is not required on prefabricated storage and pump assemblies, mounted on a common base, with container bottom a maximum of 24 inches above ground with water capacity of 2,000 gallons or less, if the piping connected to the storage and pump assembly is flexible enough to minimize breakage or leakage in case container supports fail.*
- (3) Underground containers must be installed according to this section.
- (a) Containers must be given a protective coating before being placed underground. This coating must be equivalent to hot-dip galvanizing or to two coatings of red lead followed by a heavy coating of coal tar or asphalt. During installation, take care to minimize abrasion or other damage to the coating. Repair coating damage before back-filling.
 - (b) Containers must be set on a firm foundation (firm earth may be used) and surrounded with earth or sand firmly tamped in place. Backfill should be free of rocks or other abrasive materials.
 - (c) A minimum of 2 feet of earth cover must be provided. Where ground conditions make impractical, equivalent protection against physical damage must be provided. The portion of the container to which manhole and other connections are attached may be left uncovered. If there is vehicle traffic at the site, containers must be protected by a concrete slab or other cover to prevent the weight of a loaded vehicle imposing a load on the container shell.

[Recodified as § 296-307-44011. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-44011, filed 10/31/96, effective 12/1/96.]

WAC 296-307-44013 What equipment must be protected against tampering? Valves, regulators, gauges, and other container fittings must be protected against tampering and physical damage.

[Recodified as § 296-307-44013. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-44013, filed 10/31/96, effective 12/1/96.]

WAC 296-307-44015 What requirements apply to the transport truck unloading point?

- (1) During unloading, the transport truck must not be parked on public thoroughfares and must be at least 5 feet from storage containers. The truck must be positioned so that shut-off valves are accessible.
- (2) The filling pipe inlet terminal must not be located within a building nor within 10 feet of any building or driveway. It must be protected against physical damage.

[Recodified as § 296-307-44015. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-44015, filed 10/31/96, effective 12/1/96.]

WAC 296-307-44017 What requirements apply to piping, valves, and fittings?

- (1) Piping may be underground, aboveground, or a combination of both. It must be well supported and protected against physical damage and corrosion.
- (2) Piping laid beneath driveways must be installed to prevent physical damage by vehicles.
- (3) Piping must be wrought iron or steel (black or galvanized), brass or copper pipe; or seamless copper, brass, or steel tubing and must be suitable for a minimum pressure of 250 psig. Pipe joints may be screwed, flanged, brazed, or welded. The use of aluminum alloy piping or tubing is prohibited.
- (4) All shut-off valves (liquid or gas) must be suitable for LP-gas service and designed for at least the maximum pressure to which they may be subjected. Valves that may be subjected to container pressure must have a rated working pressure of at least 250 psig.
- (5) All materials used for valve seats, packing, gaskets, diaphragms, etc., must be resistant to the action of LP-gas.
- (6) Fittings must be steel, malleable iron, or brass having a minimum working pressure of 250 psig. Cast iron pipe fittings, such as ells, tees and unions must not be used.
- (7) All piping must be tested after assembly and proved free from leaks at least at the normal operating pressures.
- (8) You must allow for expansion, contraction, jarring, and vibration, and for settling. You may use flexible connections.

[Recodified as § 296-307-44017. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-44017, filed 10/31/96, effective 12/1/96.]

WAC 296-307-44019 What requirements apply to pumps and accessory equipment? All pumps and accessory equipment must be suitable for LP-gas service, and designed for at least the maximum pressure to which they may be subjected. Accessories must have a minimum rated working pressure of 250 psig. Positive displacement pumps must have suitable pressure actuated bypass valves permitting flow from pump discharge to storage container or pump suction.

[Recodified as § 296-307-44019. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-44019, filed 10/31/96, effective 12/1/96.]

WAC 296-307-44021 What requirements apply to LP-gas dispensing devices?

- (1) Meters, vapor separators, valves, and fittings in the dispenser must be suitable for LP-gas service and must be designed for a minimum working pressure of 250 psig.
- (2) Provisions must be made for venting LP-gas from a dispensing device to a safe location.
- (3) Pumps used to transfer LP-gas must allow control of the flow and to prevent leakage or accidental discharge. Means must be provided outside the dispensing device to readily shut off the power in the event of fire or accident.

WAC 296-307-44021 (Cont.)

- (4) A manual shut-off valve and an excess flow check valve must be installed downstream of the pump and ahead of the dispenser inlet.
 - (a) Dispensing hose must be resistant to the action of LP-gas in the liquid phase and designed for a minimum bursting pressure of 1,250 psig.
 - (b) An excess flow check valve or automatic shut-off valve must be installed at the terminus of the liquid line at the point of attachment of the dispensing hose.
- (5) LP-gas dispensing devices must be located at least 10 feet from aboveground storage containers greater than 2,000 gallons water capacity. The dispensing devices must be at least 20 feet from any building (not including canopies), basement, cellar, pit, or line of adjoining property that may be built on and at least 10 feet from sidewalks, streets, or thoroughfares. No drains or blowoff lines must be directed into or in proximity to the sewer systems used for other purposes.
 - (a) LP-gas dispensing devices must be installed on a concrete foundation or as part of a complete storage and dispensing assembly mounted on a common base, and must be adequately protected from physical damage.
 - (b) LP-gas dispensing devices must not be installed within a building.

Exception: Dispensing devices may be located under a weather shelter or canopy if the area is not enclosed on more than two sides. If the enclosing sides are adjacent, the area shall be properly ventilated.

- (6) Dispensing LP-gas into the fuel container of a vehicle shall be performed by a competent attendant who shall remain at the LP-gas dispenser during the entire transfer operation.

[Recodified as § 296-307-44021. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-44021, filed 10/31/96, effective 12/1/96.]

WAC 296-307-44023 Is smoking allowed at LP-gas service stations? Smoking is prohibited on the driveway of service stations in the dispensing areas or transport truck unloading areas. Conspicuous signs prohibiting smoking must be posted within sight of the customer being served. Letters on such signs must be at least 4 inches high. The motors of all vehicles being fueled must be shut off during the fueling operations.

[Recodified as § 296-307-44023. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-44023, filed 10/31/96, effective 12/1/96.]

WAC 296-307-44025 What fire protection must be provided at LP-gas service stations? Each service station must have at least one approved portable fire extinguisher with at least an 8-B, C, rating.

[Recodified as § 296-307-44025. 97-09-013, filed 4/7/97, effective 4/7/97. Statutory Authority: RCW 49.17.040, [49.17.]050 and [49.17.]060. 96-22-048, § 296-306A-44025, filed 10/31/96, effective 12/1/96.]